

INDIAN CENTRAL COCONUT COMMITTEE  
PROCEEDINGS OF THE  
TWENTY- SEVENTH MEETING  
HELD AT COIMBATORE  
ON THE 9th JANUARY, 1960















Confidential — For Members only.



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(with Agenda and Appendices)  
OF THE  
TWENTY-SEVENTH MEETING  
OF THE  
INDIAN CENTRAL COCONUT COMMITTEE

held at Coimbatore on the 9th January, 1960

Printed at  
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1960







Before Subject No. 68 please insert the following:—

*Subject No. 67-A.* Progress report on the scheme for the maintenance of a collection block of representative varieties of coconut in Assam for the year ending 30-6-1959.

The Committee accepted the Sub-Committee's recommendation that the progress report be adopted.

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INDIAN CENTRAL COCONUT COMMITTEE

held at Coimbatore on the 9th January, 1960



Before Subject No. 63 please insert the following—

Subject No. 62-A Progress report on the scheme for the maintenance of a collection block of representative varieties of coconut in Assam for the year ending 30-6-1954.

The Committee accepted the Sub-Committee's recommendation that the progress report be adopted.

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Group photo taken on the occasion of the 27th meeting of the Indian Central Coconut Committee, held at Coimbatore on the 9th January, 1960.



Dr. M. S. Randhawa, D. Sc., I. C. S., President of the Committee, is seated in the centre and Dr. P. J. Gregory, M. A., Ph. D., (Lond) F.L.S., Secretary of the Committee, is seated at the extreme right.

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# AGENDA

## A. GENERAL

1. Confirmation of the Minutes of the 26th Meeting.
2. Changes in the personnel of the Indian Central Coconut Committee.
3. Retirement of members by rotation.
4. Election of Vice-President, Indian Central Coconut Committee, for the year 1960-61.
5. Appointment of Sub-Committees for the year 1960-61.
6. Proceedings of the meeting of the Finance Sub-Committee held on 19-9-1959.
7. Proceedings of the meeting of the Secretaries of the Commodity Committees held on 18th July, 1959.
- 7-A. Proceedings of the meeting of the Scientific Appointments Sub-Committee held on 11-8-1959 and the action taken on the decisions of the 26th meeting of the Indian Central Coconut Committee regarding subjects coming within the purview of that Sub-Committee.

## B. AGRICULTURAL RESEARCH AND DEVELOPMENT SUB-COMMITTEE (RESEARCH WING) SUBJECTS

8. Action taken on the decisions on the 26th Meeting on subjects coming within the purview of the Agricultural Research & Development Sub-Committee (Research Wing).
9. Progress Report on the Central Coconut Research Station, Kayangulam for the year ended 30-6-1959.
10. Prevention of the root and leaf diseases of the coconut palm - review of work at the Central Coconut Research Station, Kayangulam.



11. Progress report on the Central Coconut Research Station, Kasaragod for the year ended 30-6-1959.
12. Scheme for the estimation of the distance over which coconut pollen is carried by insects.
13. Establishment of permanent Research Sub-Stations – suggestion for.
14. Progress report on the Regional Coconut Research Stations Scheme, Kerala State for the year ended 30-6-1959.
15. Proceedings of the Special Sub-Committee for reviewing the future set up of the Regional Coconut Research Stations in Kerala State.
16. Progress report on the Regional Coconut Research Station at Arsikere in Mysore State for the year ended 30-6-1959.
17. Progress report on the Regional Coconut Research Station in Madras State for the year ended 30-6-1959.
18. Progress report on the Regional Coconut Research Station Scheme, Ambajipeta, Andhra Pradesh for the year ended 30-6-1959.
19. Regional Coconut Research Station Scheme, Ambajipeta, Andhra Pradesh – proposal for the extension of.
20. Proposal for raising the level of the wet land block at the Regional Coconut Research Station, Ambajipeta, (Andhra Pradesh).
21. Progress report on the Regional Coconut Research Station Scheme, Bhatye, Bombay State for the year ended 30-6-1959.
22. Regional Coconut Research Station, Bhatye, Ratnagiri District, Bombay State – proposal for the extension of.
23. Regional Coconut Research Station, Ratnagiri, Bombay State – review of work done at.
24. Progress report on the Regional Coconut Research Station Scheme at Sakhigopal in Orissa State for the years ended 30-6-'58 and 30-6-1959.

25. Proposal for upgrading the post of Coconut Research and Development Officer, Orissa.
26. Progress report on Regional Coconut Research Station Scheme, Assam for the period 9-4-1957 to 30-6-1958 and the year ending 30-6-1959.
- 26-A. Regional Coconut Research Station in Assam – Shifting of site from Rajabari to Kahikuchi-President's sanction – Ratification of.
27. Progress report on the scheme for the investigation of the Band disease of coconut in Bombay State for the year ended 30-6-1959.
28. Scheme for the investigation of the Band disease of coconut and arecanut – Report of the Special Sub-Committee.
29. Progress Report on the scheme for the control of Anabe Roga of coconut in Mysore State for the year ended 30-6-1959.
30. Scheme for laying out simple manurial trials in coconut cultivators' gardens — New Scheme.
31. Survey and collection of predatory mites on coconut.
32. Proceedings of the meeting of the Special Sub-Committee for drawing up the programme of genetical and breeding work at the Central Coconut Research Station, Kasaragod.
33. Indian Central Coconut Committee — Recruitment Rules.
34. Consolidated progress report on Category 'A' Research Schemes under the II Five-Year Plan.
- 34-A. Development of the Central Coconut Research Station, Kasaragod under the II Five-Year Plan — acquisition of additional land — appointment of special acquisition staff — ratification of President's sanction.



**C. AGRICULTURAL RESEARCH AND DEVELOPMENT SUB-COMMITTEE (DEVELOPMENT & EXTENSION WING) SUBJECTS**

35. Action taken on the decisions of the 26th Meeting of the Committee on subjects coming within the purview of the Agricultural Research and Development Sub-Committee (Development Wing) and Extension Sub-Committee.
36. Proceedings of the Coconut Nursery Officers' Conference held at Mangalore in May 1959.
37. Proceedings of the Sixth and Seventh Meetings of the Central Supervisory Body for coconut.
38. Scheme for intensive cultivation and manuring of coconuts.
39. Attachment of Development Blocks to the Central Coconut Research Stations at Kayangulam and Kasaragod.
40. Proceedings of the meetings of the Special Sub-Committee for drawing up scheme for conducting mother palms and yield competitions.
41. Film on "Growing Coconuts" — preparation of copies with Telugu commentary — ratification of sanction accorded by the President.
42. Eradication of monkeys — suggestions for.
43. Progress Report on the coconut nursery schemes in Kerala State for the year ended 30-6-1959.
44. Proposal for the extension of the Coconut Nursery scheme, Wadakkancherry, Kerala State.
45. Scheme for the establishment of coconut nurseries in N. E. S. Blocks in Kerala State — revised estimates — ratification of President's sanction.
46. Progress Report on the comprehensive coconut nursery scheme in Andhra Pradesh for the year ended 30-6-1959.

47. Comprehensive coconut nursery scheme in Andhra Pradesh—proposal for the extension of.
48. Progress report on the comprehensive coconut nursery scheme, Orissa State for the years ended 30-6-1958 and 30-6-1959.
49. Progress report on the coconut nurseries in West Bengal for the year ended 30-6-1959.
- 49-A. Progress report on the scheme for doubling the production target of coconut nurseries in Kerala State for the year ended 30-6-1959.
50. Progress report on the coconut nurseries scheme Mysore State for the year ended 30-6-1959.
51. Progress report on the comprehensive coconut nursery scheme in Madras State for the year ended 30-6-1959.
52. Progress report on coconut development scheme in Andhra Pradesh for the year ended 30-6-1959.
53. Progress report on the coconut nursery scheme, Nandgaon, Bombay State under the II Five-Year Plan for the year ended 30-6-1959.
54. Progress report on the coconut nurseries at Sakhigopal and Chatrapur, Orissa, under the II Five-Year Plan for the year ended 30-6-1959.
55. Progress report on the coconut nursery scheme under the II Five-Year Plan in Assam State for the year ended 30-6-1959.
56. Progress report on the coconut development scheme, Pondicherry under the II Plan for the year ended 30-6-1959.
57. Progress report on the scheme for coconut development and propaganda in Mysore State for the year ended 30-6-1959.
58. Progress report on the coconut development scheme in Madras State for the year ended 30-6-1959.



59. Progress report on the coconut development scheme, Saurashtra, Bombay State for the year ended 30-6-1959.
60. Progress report on coconut development scheme, Orissa, under the II Five-Year Plan, for the year ended 30-6-1959.
61. Progress report on the scheme for the development of coconut in West Bengal for the year ended 30-6-1959.
- 61-A. Progress report on the comprehensive spraying scheme in Kerala State for the year ended 30-6-1959.
62. Progress report on the schemes for the biological control of *Nephantis serinopa* in Kerala State for the year ended 30-6-1959.
63. Progress report on the parasite breeding stations in Madras State for the year ended 30-6-1959.
64. Progress report on the parasite breeding stations in Andhra Pradesh for the year ended 30-6-1959.
65. Progress report on the scheme for the biological control of coconut mite in Andhra Pradesh for the year ended 30-6-1959.
66. Parasite breeding station scheme, Puri, Orissa State — proposal for-New Scheme.
67. Progress report on the scheme for the organisation of demonstration plots in coconut growers' lands in Kerala State for the year ended 30-6-1959.
- 67-A. Progress report on the Scheme for the collection block of representative varieties of coconuts in Assam.
68. Consolidated progress report on the coconut development schemes under the II Five-Year Plan.

## **D. MARKETING AND ECONOMICS SUB-COMMITTEE SUBJECTS**

69. Action taken on the decisions of the 26th meeting of the Committee on subjects coming within the purview of the Marketing and Economics Sub-Committee.
70. Pattern of financial assistance for Statistical, Marketing and other Schemes – decision arrived at in the meeting of the Secretaries of the Commodity Committees.
71. Collection of Coconut Cess and of Statistics of copra crushed, oil extracted and cake produced — Authorisation of the Committee for enforcement of provisions in Indian Coconut Committee Act 1944 and Rules.
72. Indian Standards Institution — Increase in the Committee's Membership subscription.
73. Progress Report on the Schemes for the correct estimation of area and yield statistics of coconut and arecanut in the States of Kerala, Mysore, Madras, Andhra Pradesh, Bombay, Orissa, West Bengal and Assam.
- 73-A. Import Policy for Coconuts and Coconut Products – April-September, 1960.
- 73-B. Scheme for the Development of Coconut Marketing in Orissa.

## **E. TECHNOLOGICAL SUB-COMMITTEE SUBJECTS.**

74. Action taken on the decisions of the 26th meeting on subjects coming within the purview of the Technological Sub-Committee.
75. Co-ordination of Coconut and Arecanut Technology – Suggestion regarding.
76. Scheme for effecting improvements in the extraction of oil from copra by rotary and expeller at the Anantapur Institute — New Scheme.



77. Recruitment of staff under the coconut Technological schemes at the Central Food Technological Research Institute, Mysore and the Regional Research Laboratory, Hyderabad - ratification of sanction accorded by the President.

#### **F. FINANCE SUB-COMMITTEE SUBJECTS.**

78. Action taken on decisions of the 26th meeting on subjects coming within the purview of the Finance Sub-Committee.
79. Enhanced powers delegated to the Secretary regarding grant of honorarium-cancellation of earlier orders of Government of India.
80. Delegation of powers to Secretary, Indian Central Coconut Committee — enhancement of — decisions arrived at in the meeting of the Secretaries of the Commodity Committees.
81. Central Coconut Research Station, Kayangulam —continuance of the post of Electrician on long-term basis.
82. Scheme for the establishment of 3 Regional Coconut Research Stations in Kerala State — Grant-in-aid statement and audit certificate for the year 1954-55.
83. Coconut cess, Sales tax and fees to Regulated Market Committees — clubbing with Central Excise Duty — request for.
84. Recommendations of the Sub-Committees other than the Finance Sub-Committee having financial commitments.
85. Authorisation of a member of the Finance Sub-Committee to discharge certain functions.

#### **G. ANY OTHER BUSINESS**

**Proceedings of the 27th Meeting of the Indian Central Coconut Committee held in the Freeman Hall of the Agricultural College, Coimbatore at 9-30 A. M. on Saturday the 9th January, 1960.**

The following were present:—

1. Dr. M. S. Randhawa (President).
2. Dr. J. S. Patel, Agricultural Commissioner with the Government of India (Member).
3. Dr. B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi, (Co-opted Member).
4. Shri N. P. Chatterji, Agricultural Marketing Adviser to the Government of India.
5. Shri Prakash Krishen, Additional Secretary, Indian Council of Agricultural Research & Deputy Secretary to the Government of India.
6. Dr. S. Krishnamurthi, Dean, Agricultural College & Research Institute, Coimbatore and Additional Director of Agriculture, Madras.
7. Shri P. D. Nair, Agricultural Adviser to the Government of Kerala (Member).
8. Dr. S. R. Barooah, Director of Agriculture, Assam (Member).
9. Dr. G. R. Seth, Deputy Statistical Adviser, Indian Council of Agricultural Research.
10. Shri M. B. Nayar, Senior Marketing Officer, Directorate of Marketing & Inspection, Nagpur.
11. Shri C. R. Seshadri, Joint Director of Agriculture (Planning & Extension), Madras.
12. Shri M. Bhavanisanker Rao, Oilseeds Specialist, Madras (Co-opted Member).
13. Shri M. Narasimha Rao, Oilseeds Specialist, Andhra Pradesh, (Co-opted Member).
14. Dr. H. C. Choudhuri, Special Officer for Potatoes, West Bengal (Co-opted Member).



15. Shri D. P. Lakshminarasimhaiah, Senior Assistant Botanist, Mysore.
16. Shri S.S.S. Venkata Rao, Coconut Research & Development Officer, Orissa (Member).
17. Shri C. M. John (Member).
18. Shri P. B. Kurup (Member).
19. Shri K. P. Amrithanatha Iyer (Member).
20. Shri B. M. Peter (Member).
21. Shri A. C. Sankaranarayanan (Member).
22. Shri A. R. Sulaiman Sait (Member).
23. Shri V. J. Joseph (Member).
24. Shri R. Srinivasa Iyer (Member).
25. Shri N. Badrudeen (Member).
26. Shri Jagannath Misra (Member).
27. Shri P. T. John (Member).
28. Shri K. G. Krishnan.
29. Shri B. S. Varadarajan, Secretary, Indian Central Arecanut Committee (Co-opted Member).
30. Dr. D. S. Bhatia, Deputy Director, Central Food Technological Research Institute, Mysore.
31. Shri M. A. Mulky, Secretary, Forward Markets Commission, Bombay.
32. Shri K. Shamanna, Co-operative Marketing Officer, Indian Central Arecanut Committee (Co-opted Member).
33. Shri P. S. Mahadevan, Representative, Fertilizer Association of India.
34. Dr. S. G. Joshi, Agricultural Officer, Maharashtra Association for the Cultivation of Science.
35. Dr. K. P. V. Menon, Director, Central Coconut Research Station, Kayangulam (Co-opted Member).
36. Dr. K. M. Pandalai, Joint Director, Central Coconut Research Station, Kasaragod (Co-opted Member).
37. Dr. P. J. Gregory, Secretary.

Shri A. M. Thomas, Union Deputy Minister for Food, inaugurated the meeting.

## PRESIDENT'S WELCOME ADDRESS

Welcoming the Deputy Minister and others present. Dr. M. S. Randhawa, D.Sc., I.C.S., Additional Secretary to the Government of India and President of the Committee spoke as follows:—

Shri Thomas and Gentlemen,

It is with great pleasure that I offer you, Sir, a most hearty welcome to this 27th Plenary Session of the Indian Central Coconut Committee. The Committee is very grateful to you for having found time in the midst of so many other preoccupations to be present here today and to inaugurate this meeting. Our pleasure in having you with us today, Sir, is all the greater as your knowledge of this crop is intimate and real. I extend a cordial welcome to all those who have been good enough to respond to our invitation and also to the newly nominated members of the Committee, namely, Shri Reddy, Director of Agriculture, Andhra Pradesh, Shri V. V. Sample, Shri A. C. Bose, Joint Secretary, Ministry of Finance and Shri P. D. Nair.

### Prices

The year 1959 may be said to have been a fairly good year to the coconut cultivator as far as prices were concerned. The price of coconut oil in the Cochin market was maintained above Rs. 2,000 per ton except for the latter part of April and the first week of May when the price went slightly below the Rs. 2,000 mark. But the average price for April and May was Rs. 2,002 per ton. The highest price recorded during the year was Rs. 2,267 on the 27th November and a few other days and the lowest Rs. 1,977 on the 11th April and some other days. Since the beginning of September, an upward trend persisted and the price level was well above Rs. 2,200 per ton.

As far as coconuts were concerned the average price for nuts without husk at Cochin was about Rs. 183 per thousand in January and moved up to Rs. 185 in February, Rs. 190 in March and Rs. 194 in April. The



average for May was Rs. 197 and June saw it at Rs. 200. This was maintained in July and increased to Rs. 205 in August. The August average was repeated in September, but in October it came down to Rs. 188. In spite of these occasional set-backs it can be said that the price was fair to the producer.

### **Import Policy**

The Government of India's import policy has been favourable to the coconut industry of the country and has helped to keep the prices fair and stable. The import policy for the licensing periods ended March, 1959 and September, 1959, was to issue import licences to "actual users" of copra only on an *ad hoc* basis. Imports of coconuts and coconut oil were not allowed. The same policy has been continued for the import period ending March 1960. As I have often stressed before, I hope that the coconut growers will utilise this price incentive for increasing the production of this commodity by investing in purchase of fertilizers and pesticides.

### **Special Committees – Conference of Research Workers, Nursery Officers' Conference Etc.**

During the year that has passed, some important meetings and conferences were held in pursuance of decisions taken by the Committee at its last meeting. The Sub-Committee that had been set up under the Chairmanship of Dr. S. M. Sikka to draw up a detailed programme of breeding and genetical work at the Central Coconut Research Station, Kasaragod, visited that Station as well as the Central Coconut Research Station, Kayangulam, and drew up a report which is now before you for your approval. I feel sure that the implementation of this programme is going to have far-reaching consequences on the development of the Indian coconut industry.

As decided by the Committee at its last meeting, a Nursery Officers' Conference and a Research Workers' Conference also were held during the year, the first one in May and the other in the third week of December.

The recommendations of the Nursery Officers' Conference are before you for your approval. As you will see from them, the Conference was of the view that the organisation of private nurseries was desirable in certain coconut-growing areas. As suggested by the Conference, a questionnaire has been issued by the Committee's Secretariat to elicit information regarding the setting up and control of private nurseries before setting up a Special Sub-Committee to formulate appropriate rules. The Conference has also made certain recommendations regarding the marking of mother palms, the maintenance of mother palm registers and the issue of mother palm cards to the owners of such palms. The implementation of these suggestions would ensure a regular supply of quality seednuts which are required in such large numbers to raise quality seedlings the demand for which is ever on the increase.

The Coconut Research Workers' Conference held at Trivandrum on the 21st, 22nd and 23rd December 1959, was a success. About 50 research papers were read and discussed at the conference and I hope that these discussions will help the research workers a great deal.

Another Sub-Committee also met during the year and produced a report on the organisation of coconut crop competitions on the basis of the yield of gardens as well as the presence in them of parent palms. It is very essential to maintain mother palms in proper condition and those who take the trouble to do so deserve to be recognised and rewarded; hence the proposal to award prizes for the possession of mother palms by growers.

### **Second Five-Year Plan Schemes**

Schemes sanctioned under the Second Five-Year Plan had gone under way fairly fully during 1959. At the Central Coconut Research Stations at Kasaragod and Kayangulam all the posts sanctioned under the Second Plan had been filled up. At the latter Station an insect-proof house to undertake virus transmission trials had been completed as well as a pot culture house, an Insectory and Meteorological Tower. An additional area of 5.46 acres had been acquired for the Station and put



in possession of the Committee. At the Kasaragod Station the construction of a glass house is nearing completion and an area of about 34 acres of sandy soil is being acquired.

Sample surveys for the correct estimation of area and yield are under way in all the coconut-growing States except Orissa and West Bengal and technological schemes to investigate the utilisation of coconut shell to make activated charcoal and the solvent extraction of coconut oil are being worked at the Regional Research Laboratory at Hyderabad. A scheme to make vinegar from neera is being worked at the Central Food Technological Research Institute, Mysore.

### **Nursery Schemes**

Out of the 67 nurseries which have been set up, 21 are in Kerala, 13 in Assam, 8 each in Mysore and Andhra Pradesh, 5 each in Madras and Orissa, 3 in West Bengal and 2 in Bombay. Their production target was 9,43,000 seedlings and they were able to distribute 4,41,000 seedlings in 1959. The total production target for the last 3 years was 22 lakh seedlings and 11 lakh seedlings were raised. Good work has been done in the State of Kerala. Out of the total number of 67 nurseries, 41 were proposed under the II Five-Year Plan scheme. They had a target of 12,88,000 seedlings for 3 years, while their production was 4,16,438. An additional production of 10 lakh seedlings was suggested in the schemes which were initiated by the Committee and 7 lakh seedlings were raised due to the initiative taken by the Committee. However, it is desirable to step up the production of seedlings in the nurseries so that more plants become available for planting next year.

### **Scheme for selecting Mother Palms**

The Committee has formulated a useful scheme for selecting mother palms. It is proposed to give a reward of Rs. 2 per mother palm, which is high yielding. The minimum bearing which is necessary is 100 nuts. The sole objective of the scheme is to select high bearing trees so that their nuts are utilised in our

nurseries. A prize of Rs. 500 will be given to the grower who has the largest number of mother palms in the State. Certificates should also be issued to growers who have the largest number of mother palms in each district and block. Such prizes should be given at specially organised functions so that the owners of such mother palms are honoured and also get widest possible publicity.

### **Spraying Scheme in Kerala State**

As you know, 70 lakhs of coconut palms are affected by disease in the State of Kerala, and it is proposed to spray these palms twice a year with copper fungicide and D. D. T. The Kerala State Government has a provision of Rs. 10 lakhs for spraying. As against a target of 140 lakh sprayings, 80 lakh sprayings were done. Full benefit from the sprayings can only be secured if the diseased palms are also adequately manured. This is not being done to the extent required. I hope that the State Government will also intensify its manuring programme along with the spraying programme.

### **Regional Research Stations on Coconut**

There are 8 Regional Coconut Research Stations out of which 2 are located in Kerala and one each in the States of Mysore, Madras, Andhra Pradesh, Bombay, Orissa and Assam. The research stations in Kerala were set up in 1947; in Andhra Pradesh and Bombay in 1955; in Assam in 1957, and in Mysore and Madras in 1958. With the exception of Assam and Mysore, in all other places the buildings have been constructed. The non-recurring expenditure of these regional stations is borne by the State Governments and 50 per cent. of the recurring expenditure is met by this Committee for a period of first ten years. We should decide the future of these Regional Stations very early. Apart from problems of local research, i. e., agronomical problems relating to application of manures and fertilizers, nurseries have also been set up at all these stations. It is desirable that these Stations are made permanent, so that anxiety on



account of uncertainty regarding their future which the employees of these stations have, is ended, and they get security. It is proposed that the present arrangement should continue for a period of 15 years after which the State Governments should completely take over these stations. The technical programmes of these research stations should be sent to the Committee for its scrutiny, and it would also be desirable that the Director of the Coconut Research Station, Kayangulam and the Joint Director of the Coconut Research Station, Kasaragod, inspect these stations according to a programme. They should ensure during these inspections that there is no unnecessary duplication or repetition of work which has already been done.

### **Intensive cultivation of coconuts**

Intensive cultivation of coconuts includes 5 items, namely, (1) growing of green manure or green leaf by planting 2 *Gliricidia* plants for every coconut tree, (2) application of fertilizers, manures, silt or clay according to suitability, (3) ploughing of the coconut gardens to destroy weeds at the end of rainy season, (4) control of diseases and pests, and (5) irrigation of orchard where possible.

The State Governments have prepared a useful time-table of operations. The next step should be to prepare a schedule of operations connected with the promotion of the intensive cultivation campaign. The duties for the Village Level Workers, Agricultural Demonstrators, Agricultural Extension Officers, Block Development Officers and the District Level staff should be clearly defined. The role of Panchayats, Co-operatives and Farmers' Clubs and Associations in promoting and sustaining the campaign for intensive cultivation should be clearly indicated. The number of educational demonstrations to be laid down on farmers' lands will have to be determined for each block and taluk. Targets and reports for various levels of officers will have to be prescribed before the campaign for intensive cultivation of coconut is actually launched. I should like all these operations to be done before next

April so that the campaign for intensive cultivation of coconuts can be launched in May-June next. The staff located on the Committee's Research Stations and officers in charge of coconut nurseries should fully co-operate in carrying out the campaign in the areas surrounding their headquarters.

For all our development schemes there should be clear-cut area-wise targets for the 5 items that are included in the intensive cultivation programme. The annual reports of the States should indicate these targets for the regions in the States and the achievements during the year.

### **Third Five-Year Plan**

At its last meeting the Committee had approved of the working papers on coconut research and coconut development under the Third Plan. The Government of India have now allotted on a tentative basis Rs. 50.13 lakhs for coconut research and Rs. 264 lakhs for coconut development. Of the amount allotted for research, a sum of Rs. 25.13 lakhs is to meet committed expenditure, that is, to continue under the Third Plan the schemes already being worked under the Second Plan and Rs. 25 lakhs for new expenditure. Similarly in regard to coconut development, committed expenditure sanctioned is of the order of Rs. 40 lakhs while new expenditure is Rs. 224 lakhs.

So far as the research schemes are concerned, the Government of India will make available to the Committee necessary funds while in regard to development schemes the Central Government will pay their contribution direct to the State Governments while the Committee will be held responsible for the technical scrutiny of schemes and their progress.

As you may remember the additional production target that had been fixed to be achieved at the end of the Third Plan period was 1,250 million nuts. But this target would be possible of achievement only if manuring on an extensive scale to cover 60 per cent of the coconut acreage in the country is ensured.



## **Publications**

The Committee has produced a monograph and an atlas which contains information of a statistical nature. Both these publications have been appreciated and are proving useful. In addition, a number of useful pamphlets on extension have been produced which I hope the State Governments will utilise. Copies of the extension publications should also be provided to the Extension Wing of the Ministry of Food and Agriculture, so that they utilise them. I appreciate this good work done by the Secretary, Dr. Gregory, and the Directors of Central Research Stations in producing these valuable pamphlets.

## **Concluding Remarks**

Before I conclude I have great pleasure in thanking the Madras Government for the arrangements which they have made for these meetings. I am particularly thankful to Dr. S. Krishnamurthi, Additional Director of Agriculture, Madras Government, for the hospitality which he has provided to the Committee, and for the excellent arrangements he has made for the meetings. Incidentally the members of this Committee also got an opportunity of visiting some of the farms, and were impressed by the high level of skill which the farmers of this area have shown in developing their farms. Their system of irrigation and methods of farming, which they have developed, deserve to be emulated in other parts of India also.

Now I have much pleasure in requesting you, Sir, to inaugurate this meeting, and to address the members of this Committee.

## **DEPUTY MINISTER'S ADDRESS**

Inaugurating the meeting, Shri A. M. Thomas, Union Deputy Minister for Food, spoke as follows:-  
Dr. Randhawa and Friends,

When I was requested to inaugurate this plenary session of the Indian Central Coconut Committee, I

readily consented to do so for reasons more or less the same as those which Dr. Randhawa has indicated in his welcome address. As one belonging to Kerala, I am naturally interested in all that pertains to the coconut, for I believe that the coconut palm is practically the staff of life for the people of that State. In prosperity and in adversity, they have to lean on it heavily and their being prosperous or not depends a lot on the fortunes of this palm. And, therefore, I could not resist the call of this Committee which is dedicated to the purpose of improving and developing the Indian coconut crop. Moreover, having been the Vice-President of the Indian Central Arecanut Committee for a number of years, I confess to having a special interest in the activities and well being of these commodity committees.

Shri K. P. Madhavan Nair, your Vice-President, has not been able to attend today's meeting and he has asked me to convey to you his apologies for not being able to be present here today. He has told me that this is the first time that he is failing to attend a meeting of the Committee ever since he became its Vice-President. We were together at an important committee meeting and as that meeting is continuing it has not been possible for him to go over here.

### *Functions of the Committee*

I claim to know rather well what the Indian Central Coconut Committee has been trying to do during the last 15 years of its existence, what it has accomplished and what it hopes to achieve.

The main functions of the Committee are the promotion of agricultural, industrial, technological and economic research in respect of coconut, encouragement of co-operative effort among coconut growers, improvement of marketing methods, collection of statistics regarding various aspects of the coconut industry and the supply of information concerning the coconut industry to Government departments, the trade and the general public.



### *Research activities*

Started early in 1945, the Committee had succeeded in establishing within the next two or three years, its Central Coconut Research Stations at Kasaragod and Kayangulam, which today are deservedly well known in the world of coconut research for the good work they are doing.

The Central Coconut Research Station at Kasaragod has been tackling problems of a fundamental nature such as breeding new varieties, and the Station at Kayangulam problems connected with the pests and diseases of the coconut.

The work so far done at the Central Coconut Research Station, Kasaragod has shown that certain exotic varieties of coconut such as the Laccadive ordinary, Laccadive small, Fiji and Straits Settlements are useful for propagation in this country, that by hybridisation desirable characters found in different varieties or individuals can be brought together in an individual, that the shedding of immature nuts can be controlled by spraying certain hormone mixtures, that the highest yield of nuts is obtained from plots which are regularly cultivated and manured and that root pruning is effective in inducing the palms to produce inflorescences, etc. I am glad to note that greater emphasis is now sought to be laid on the breeding aspect of the work at the Central Coconut Research Station, Kasaragod and that a detailed programme has been drawn up for the purpose.

As a result of the investigations at the Central Coconut Research Station, Kayangulam, methods have been devised for the control of serious coconut pests such as the rhinoceros beetle, the Leaf-eating caterpillar, the palm weevil and the cockchafer grub. It has been found that foliar spraying with copper fungicides like Bordeaux mixture twice or thrice a year controls the leaf-rot disease. The root (wilt) disease still remains a challenge to researchers, but it has been shown that by proper cultural practices and regular manuring the disease can be kept under control and the yield of the trees kept at a fairly reasonable level. I appreciate

the good work so far done by Dr. Gregory, Secretary of the Committee and the Directors of the Research Stations.

Three regional research stations were started in Kerala at about the same time as the Central Research Stations with financial assistance from the Committee. Regional Stations have been set up since in the States of Orissa, Assam, Bombay, Andhra Pradesh, Mysore and Madras. Results of the work done at these Stations have, however, not yet been passed on to the cultivators of the areas concerned.

### *Importance of Research*

I do not believe that research is a magic wand with one wave of which, the desired object will appear in front of us. It is time-consuming. All research is so and agricultural research even more so and in the latter field, work on a perennial crop like the coconut is perhaps the least rewarding as far as immediate returns are concerned. At the same time we cannot afford research to be brought down to the level of some mechanical processes which will just go on and on, the goal always receding before us like the horizon. There is need on the part of the research worker to have a constant awareness of the problems tackled, enthusiasm and alertness and above all the quality of imagination.

I think that research done even in respect of a perennial tree like the coconut should have its long-term and short-term objects. There must be a score of different ways in which a coconut grower could add to his income — a rupee here or a rupee there. These must be tested out in our Stations and then the most unrelenting persuasive pressure brought to bear upon the cultivators to see that they help themselves.

### *Development activities*

On the development side one of the outstanding achievements of the Committee has been the network of coconut nurseries which have been set up by the Governments of the coconut growing States with financial aid from the Committee. About 18.63 lakhs of



seedlings have been supplied from these nurseries so far. Besides these, 1.11 lakhs of seedlings have been supplied from the nursery attached to the Central Coconut Research Station at Kasaragod. But the demand for seedlings for underplanting and new planting has been estimated to be of the order of about 13 lakhs per annum as has been pointed out by Dr. Randhawa. The production of quality seedlings has been sought to be raised by starting more nurseries under the Second Plan, but even with these it may be possible to meet only a part of the demand. The Committee has, therefore, started to think in terms of utilising the services of private nurserymen. If private nurserymen could be made to produce, under proper supervision, quality seedlings it would be a step in the right direction.

When experiments in the Research Station proved that foliar spraying with copper fungicides could control the leaf-rot disease, the Committee started to demonstrate it in the gardens of the growers. Several *ad hoc* schemes for the purpose were implemented and these have now found fulfilment in the comprehensive spraying scheme which the Kerala Government have been implementing since November 1956 to cover about 70 lakhs of palms situated in an area of about 1 lakh of acres spread over 22 taluks of the State.

### *Second Plan Scheme*

Coconut development did not come within the purview of the First Five-Year Plan. But under the Second Plan a number of schemes have been sanctioned both for coconut research and coconut development. India being a deficit producer of coconuts the object of the schemes is to step up coconut production as far as possible. They include expansion of the work already being done at the Central Coconut Research Stations, the conduct of statistical surveys to estimate the correct area under and the production of coconuts in the various coconut-growing States, the setting up of a large number of coconut nurseries, the laying out of demonstration plots and the implementation of coconut development schemes.

I am told that although it was proposed to step up coconut production in the country by about 870 million nuts by the end of the Second Plan as a result of the various schemes mentioned above, in actual practice, the extra production may not go beyond 350 million nuts. The target for the Third Plan has, therefore, been fixed at an extra production of 1250 million nuts. The programme of work for the Third Plan period is practically the same as that for the Second Plan with increased scope for the various items.

It has been pointed out that it is essential to make substantial provision for the manuring of coconut gardens if the production target that has been fixed is to be achieved. It has been suggested that this could be achieved by declaring coconut as a food crop that comes within the ambit of the "Grow More Food" Campaign, so that coconut growers could get the subsidies and concessions the growers of food crops get. I cannot say, now and here, what the Government of India's approach to this question has been, nor will you expect me to make any positive statement on it on this occasion. But I can assure you that I shall do all that I possibly can in the matter.

I am glad to hear that the Monograph on the Coconut Palm for which I wrote a Foreword last year, the Coconut Atlas and other publications of the Committee are having good reception. The compilation and production of such books and pamphlets are indeed creditable achievements for which the Committee can legitimately take pride.

Having said so much, I am constrained to observe that it has not been possible for the Committee to do anything substantial in the matter of promoting co-operative effort among coconut growers and also in the field of marketing. I feel sure that if the Committee and the State Governments will put their heads together some fruitful activity in this connection is bound to emerge. It is needless for me to say that all the research and development work of the Committee will be as good as futile if ultimately the grower is not able to get more



out of his crop. And this will be possible only if growers are organised co-operatively and they are enabled to market their produce to the maximum advantage.

I think, I shall not take any more of your time. You have a pretty big agenda before you and while formally inaugurating the session, I wish you godspeed in your labours.

### *Thanksgiving*

Proposing a vote of thanks, Shri. A. R. Sulaiman Sait said:— Shri A. M. Thomas, Dr. Randhawa and Friends,

I have been entrusted with the task of proposing a vote of thanks on this occasion. Let me therefore first of all express our sincere feelings of gratitude and thankfulness to Shri. A. M. Thomas, Deputy Minister for Food for having kindly inaugurated this 27th plenary session of the Indian Central Coconut Committee here this morning. In his inaugural address he has given us some very valuable and practicable suggestions for the development of coconut plantations in our country, and we are thankful to him for his advice and suggestions. It is indeed very kind of you, Sir, to have come over here in the midst of pre-occupations, to inaugurate our meeting today and I once again on behalf of the Committee thank you very much for having accepted our invitation.

It will not be out of place if I, on an occasion like this, venture to make a few observations with regard to the work and activities of the Indian Central Coconut Committee for the past 15 years of its existence. The object for which this Committee was constituted 15 years ago by the Government of India was to find out all possible ways and means to increase the production of this important commodity, which plays a very vital and significant role in the economy of Kerala State. You all know, friends, that we are not self-sufficient as far as coconut production is concerned. Only two-thirds of our requirements are produced in India and for the remaining one-third we are entirely depending on

imports from Ceylon and other foreign countries and therefore this Committee is endeavouring from its very inception to see that we fulfil the target of one-third production and become self-sufficient so far as this commodity is concerned. I can tell you that during the last 15 years this Committee has undoubtedly made some progress in that direction. Still we have to pay more attention to this aspect and I am sure that in future when all the schemes which have been undertaken by the Committee for implementation during the II and III Five-year Plans are completed, there will undoubtedly be a substantial increase in our production. But, for that purpose, it is necessary that the State Governments concerned should take some more interest for implementing the development schemes they have started and the Central Government should come to the help of the Committee with grants and other subsidies.

I am very glad that Mr. Thomas in his inaugural address has dealt with the question of declaring coconut as a food crop. So I do not want to speak more on the subject.

Out of about 16 lakhs of acres under coconut in the whole of India, about 11 lakhs of acres are in Kerala State and 85% of the coconuts produced in the country is used for edible purposes. Therefore there is every justification to declare coconut as a food crop at least in Kerala so that this crop can also get the advantages and benefits which the other food crops are getting.

I am very glad that we have been able to have in our midst Mr. Thomas who is a native of Kerala, and therefore knows intimately the problems of our State regarding food and agriculture. I do hope that Shri. Thomas will persuade the Central Government to assist us in future.

Before I conclude, I would like to thank Mr. Raja Ram, Secretary to Madras Government for all the assistance he has rendered to us in connection with the holding of this meeting. I also thank Dr. S. Krishnamurthi, for the splendid arrangements made by



him for holding this meeting and for all the services he has rendered. Principal Mariakulandai and other members of the staff of the Agricultural College and Research Institute also deserve our heart-felt thanks. They have done hard work but they have done it with a smile on their face. I would also like to thank Dr. Gregory, Secretary of the Committee and his staff for the able and efficient manner in which they have arranged this meeting. We are indeed very very grateful to them all.

### **General Decisions**

*Subject No. 1.* Confirmation of the Minutes of the 26th Meeting.

The minutes of the 26th meeting of the Committee held on the 17th January 1959 were confirmed.

*Subject No. 2.* Changes in the personnel of the Indian Central Coconut Committee.

The Committee took note of the changes in the membership of the Committee mentioned in the Secretariat note on the subject.

*Subject No. 3.* Retirement of members by rotation.

The Committee took note of the fact that the following members were due to vacate office on the 31st March 1960, and that the Governments concerned and the Indian Merchants' Chamber were being addressed to forward the names of persons whom they wished to nominate for the 3-year term commencing on the 1st April 1960:—

(1) Shri B. M. Peter, (2) Shri K. P. Amrithanatha Iyer, (3) Shri K. A. Keraleeyan, (4) Shri A. C. Sankaranarayanan, (5) Shri S. R. Sabariperumal Pillai, (6) Shri C. H. Lingadevaru, (7) Shri Alluri Satyanarayana Raju, (8) Shri A. R. Sulaiman Sait, (9) Shri A. R. M. Chakrapani Reddiar, (10) Shri P. T. John, (11) The Director of Agriculture, Andhra Pradesh, (12) Shri C. M. John.

*Subject No. 4.* Election of Vice-President, Indian Central Coconut Committee for the year 1960-61

Shri P. B. Kurup proposed that Shri K. P. Madhavan Nair be re-elected Vice-President of the Committee for the twelve months beginning on the 1st May 1960.

Shri K. P. Amrithanatha Iyer seconded the proposal.

As there was no other proposal, Shri K. P. Madhavan Nair was unanimously declared elected as the Vice-President of the Committee for one year commencing on the 1st May 1960.

*Subject No. 5.* Appointment of Sub-Committees for the year 1960-61.

The Committee appointed the following Sub-Committees for the 12 months commencing on the 1st May 1960:—

#### **Finance Sub-Committee**

1. Vice-President (Chairman, Ex-officio)
2. President (Member Ex-officio)
3. Shri V. Eacharan
4. „ A. R. Sulaiman Sait
5. „ B. M. Peter
6. „ V. J. Joseph
7. „ P. B. Kurup
8. „ P. D. Nair, Agricultural Adviser to Government of Kerala
9. „ C. H. Lingadevaru
10. „ T. Bhaskara Rao
11. The Secretary

#### **II. Agricultural Research and Development Sub-Committee (Research Wing)**

1. The Director, Indian Agricultural Research Institute, (Co-opted) – Chairman
2. The President
3. The Vice-President
4. Head of the Division of Mycology, Indian Agricultural Research Institute (Co-opted)
5. Head of the Division of Plant Physiology, Indian Agricultural Research Institute (Co-opted)



6. Head of the Division of Entomology, Indian Agricultural Research Institute (Co-opted)
7. The Statistical Adviser to Indian Council of Agricultural Research (Co-opted)
8. Shri P. D. Nair, Agricultural Adviser to the Government of Kerala
9. The Director, Central Coconut Research Station, Kayangulam (Co-opted)
10. The Joint Director, Central Coconut Research Station, Kasaragod (Co-opted)
11. Shri C. M. John
12. The Oilseeds Specialist, Madras (Co-opted)
13. The Director of Agriculture, Andhra Pradesh
14. The Oilseeds Specialist, Andhra Pradesh (Co-opted)
15. The Director of Agriculture, Madras
16. The Director of Agriculture, Mysore
17. The Arecanut Specialist (Co-opted)
18. The Director of Agriculture, Bombay or his representative
19. Dr. S. R. Barooah
20. Dr. H. C. Choudhuri (Co-opted)
21. The Director of Agriculture, Kerala (Co-opted)
22. Deputy Director of Agriculture (Coconut Development), Kerala (Co-opted)

### **III. Agricultural Research and Development Sub-Committee (Development and Extension Wing)**

1. The Agricultural Commissioner with the Government of India (Chairman)
2. The President
3. The Vice-President
4. The Additional Agricultural Commissioner with the Government of India
5. The Director of Agriculture, Madras

6. Shri P. D. Nair, Agricultural Adviser to the Government of Kerala
7. The Director of Agriculture, Mysore
8. Oilseeds Specialist, Madras (Co-opted)
9. Additional Development Commissioner, Kerala (Co-opted)
10. The Director of Agriculture, Andhra Pradesh.
11. The Joint Director of Agriculture (Extension), Mysore (Co-opted)
12. Shri B. M. Peter
13. „ S. R. Sabariperumal Pillai
14. „ K. P. Amrithanatha Iyer
15. „ C. H. Lingadevaru
16. „ Jagannath Misra
17. „ Alluri Satyanarayana Raju
18. „ Abdus Shokur
19. „ A. C. Sankaranarayanan
20. „ R. Srinivasa Iyer
21. Dr. P. R. Mehta, Deputy Director (Plant Diseases), Directorate of Plant Protection, Quarantine and Storage, Government of India (Co-opted)
22. The Oilseeds Specialist, Andhra Pradesh (Co-opted)
23. The Director of Agriculture, Kerala (Co-opted)
24. The Deputy Director of Agriculture (Coconut Development, Kerala (Co-opted)
25. The Secretary

#### IV Marketing and Economics Sub-Committee

1. The President (Chairman)
2. The Vice-President
3. Agricultural Marketing Adviser to the Government of India
4. Agricultural Commissioner with the Government of India



5. The Director of Agriculture, Mysore
6. The Director of Agriculture, Madras
7. Shri P. D. Nair, Agricultural Adviser to the Government of Kerala
8. Shri Abdus Shokur
9. Shri Jagannath Misra
10. Shri V. J. Joseph
11. Shri K. A. Keraleeyan
12. Mr. A. B. Argo
13. Shri A. R. Sulaiman Sait
14. Shri B. M. Peter
15. Shri S. C. Balakrishnan
16. Shri P. T. John
17. The Co-operative Marketing Officer, Indian Central Arecanut Committee, (Co-opted)
18. The Director of Agriculture, Andhra Pradesh
19. The Registrar of Co-operative Societies, Kerala (Co-opted)
20. The Director of Agriculture, Kerala (Co-opted)
21. The Deputy Director of Agriculture (Coconut Development), Kerala (Co-opted)
22. The Secretary

#### V. Technological Sub-Committee

1. Dr. V. Subrahmanyam (Chairman - Co-opted)
2. The President
3. The Vice-President.
4. Shri P. T. John
5. „ P. B. Kurup
6. „ C. M. John
7. „ K. P. Amrithanatha Iyer
8. Mr. A. B. Argo
9. Shri T. Bhaskara Rao.
10. Dr. K. S. Murthy, Principal, Oil Technological Institute, Anantapur (Co-opted)
11. The Oil Technologist, Kerala Soap Institute, Kozhikode (Co-opted)

12. The Arecanut Technologist (Co-opted)
13. The Director of Agriculture, Kerala (Co-opted)
14. The Deputy Director of Agriculture, (Coconut Development), Kerala (Co-opted)
15. The Secretary.

#### VI. Scientific Appointments Sub-Committee

1. The President (Chairman)
2. The Vice-President
3. Shri P. B. Kurup
4. The Agricultural Commissioner with the Government of India
5. The Secretary

*Subject No. 6.* Proceedings of the meeting of the Finance Sub-Committee held on 19-9-1959.

The Committee took note of the proceedings of the Finance Sub-Committee meeting held on the 19th September 1959.

*Subject No. 7.* Proceedings of the meeting of the Secretaries of the Commodity Committees held on 18-7-1959.

The Committee noted the information contained in the proceedings of the meeting of the Secretaries of the Commodity Committees held on the 18th July 1959.

*Subject No. 7-A.* Proceedings of the meeting of the Scientific Appointments Sub-Committee held on 31-8-1959 and the action taken on the decisions of the 26th meeting of the Indian Central Coconut Committee regarding subjects coming within the purview of that Sub-Committee.

The Committee took note of the proceedings of the Scientific Appointments Sub-Committee held on the 31st August 1959 and the action taken on the decisions of this Sub-Committee taken in January 1959.

#### **Decisions on Subjects coming within the purview of the Agricultural Research and Development Sub-Committee (Research Wing)**

*Subject No. 8.* Action taken on the decisions of the 26th meeting on subjects coming within



the purview of the Agricultural Research and Development Sub-Committee (Research Wing).

While taking note of the action taken on the decisions of the 26th meeting of the Committee the Sub-Committee had recommended as follows:—

1) that to meet the increasing demand, a special Sub-Committee consisting of Shri C. M. John, Dr. K. M. Pandalai and M/s. M. Bhavanishankar Rao, M. P. Narasimha Rao and D. P. Lakshminarasimhaiah be constituted to draw up a programme for the production of hybrid (T x D) seedlings at the Central Coconut Research Station, Kasaragod, for being supplied to the Regional Coconut Research Stations and

2) that the literature on the biological control of Rhinoceros beetle obtained from the South Pacific Commission be supplied to the State Departments of Agriculture also.

The report of the Special Sub-Committee attached as Annexure I to these proceedings was approved by the Committee which accepted the Sub-Committee's second recommendation also.

Subject No. 9. Progress report on the Central Coconut Research Station, Kayangulam for the year ended 30-6-1959.

The Committee accepted the Sub-Committee's recommendation that the progress report be adopted subject to the following observations:—

1) That a summary of the salient features of the work done be given at the beginning of the report;

2) that the progress report be prepared on the model of similar reports of the Indian Council of Agricultural Research;

3) that field experiments be laid out in consultation with the Statistical Adviser, Indian Council of Agricultural Research; and

4) that studies on the foliar application of fertilisers be also undertaken, both on healthy and diseased palms.

*Subject No. 10. Prevention of the root and leaf diseases of the coconut palms - review of work at the Central Coconut Research Station, Kayangulam.*

The Committee endorsed the Sub-Committee's view that while sharing the anxiety of the Kerala Government to see that the problem of coconut diseases was effectively tackled, there was no need to take up immediately a review of the work being done at the Central Coconut Research Station, Kayangulam as a comprehensive review had been done only recently, but that reviews may be arranged at 3-year intervals, as decided upon earlier.

*Dr. K. P. V. Menon*, Director, Central Coconut Research Station, Kayangulam explained that spraying the palms with copper fungicides and regular cultivation and manuring of the gardens could keep the diseases under control.

*Shri K. P. Amruthanatha Iyer*, speaking from his experience, emphasized the importance of liming and irrigation and observed that by following a systematic schedule of liming, manuring, cultivation, irrigation and spraying diseased palms could be improved greatly.

*Shri C. M. John* stressed the need for concentrated spraying in a wide enough belt on the periphery of the disease affected area to prevent further spread of infection and said that badly affected trees should be cut and removed rather than retained and manured. He was of the view that Bordeaux mixture was more effective than other copper fungicides for spraying the palms. He thought that the diseases could be controlled (1) by cutting and removing badly affected trees (2) manuring (3) proper soil management and (4) by spraying the palms with Bordeaux mixture.

*Shri. P. D. Nair* explained that the object of the comprehensive spraying scheme undertaken by the Kerala Government includes the establishment by intensive spraying of an 8-mile wide disease free zone in the northern and southern extremities of the disease affected area. To conduct the work properly they



required annually about Rs. 30 lakhs for contingent expenditure and 3000 sprayers. Only half of these is now available. There was no doubt about the efficacy of spraying. With regular spraying and manuring the disease could be brought under control in 5 years and the yield of the palms stepped up. But the funds and equipment of the magnitude mentioned earlier were required to tackle the situation effectively. It was essential to go ahead with this work, if Kerala's coconut palms which even now produced annually Rs. 50 crores worth of nuts were to be protected from further deterioration. The annual loss to coconut growers on account of reduction in yield due to disease may be estimated at about Rs. 5 crores.

Shri M. G. Raja Ram described the campaign he had organised in the South Kanara District to combat the *Nephantis serinopa* pest of the coconut palm. He pointed out that he had mobilised all available personnel from village to taluk level. Panchayat members, teachers and school children, both boys and girls all had been enlisted. Targets were fixed for schools and in order to stimulate healthy rivalry among them prizes in kind such as fertilisers, green manure seeds, etc., had been offered. Posters, hand bills, cinema slides—all were pressed into service to promote the campaign which had been organised in the summer months of March to May when the schools would be closed.

Arising out of the discussions the Committee decided —

- 1) to request the Kerala Government to mark out all diseased coconut palms which were found to be beyond redemption and to appoint tree-cutting squads for cutting and removing the marked palms;
- 2) to request the Government to organise during the months of March-May a campaign for the removal of such trees, offering to their owners inducements in the shape of manures, quality seedlings etc; and

- 3) to request the Kerala Government to take up spraying work on the scale suggested by Shri P. D. Nair;
- 4) to recommend the linking up of manuring with the spraying campaign (that manure doses be fixed after proper soil examination) and
- 5) to recommend Bordeaux mixture as superior to other fungicides for spraying coconut palms.

*Subject No. 11.* Progress report on the Central Coconut Research Station, Kasaragod for the year ended 30-6-1959.

The Committee accepted the Sub-Committee's recommendation that the progress report be adopted with the suggestion that the yield data be recorded in terms of the copra and oil content of the nuts also.

The Committee also accepted the following general recommendations of the Sub-Committee, which applied to both the Central Research Stations of the Committee:—

- 1) That the progress reports on the two Central Coconut Research Stations at Kasaragod and Kayangulam be presented as a single report because this would not only be more convenient but would emphasize the integrated programme of research on the coconut palm;
- 2) That it would be helpful if in addition to the report of the work done at the Central Stations, a summary was also given of the main results achieved during the year at the regional stations and sub-stations dealing with coconut research;
- 3) That the Director, Central Coconut Research Station, Kayangulam besides being responsible for the research investigations at the Central Coconut Research Stations should also take an active interest in the research programmes of the other stations dealing with coconut research;



- 4) That it would be very desirable for the Director, Central Coconut Research Station, Kayangulam, to visit the other stations concerned with coconut research as this would promote closer co-ordination and co-operation between the research work in progress at the Central Stations and the other centres;
- 5) That the emphasis on research investigations at the Central Research Stations at Kasaragod and Kayangulam should be on fundamental and basic problems while the Regional Coconut Research Stations should concentrate on applied research; and
- 6) That an important function of the latter should be the study and assessment of genetic material selected by the Central Research Stations and they (the regional stations) should function as active centres for the propagation and distribution of superior seedlings most suitable for particular areas.

*Subject No. 12.* Scheme for the estimation of the distance over which coconut pollen is carried by insects.

The Committee noted that this was actually not a scheme and accepted the Sub-Committee's recommendation that the programme of work for the estimation of the distance over which coconut pollen is carried by insects be approved. The Committee also noted that the proposed investigations were of a preliminary nature and would be followed by more work if the results so justified.

*Subject No. 13.* Establishment of permanent Research Sub-Stations — suggestion for.

The Sub-Committee recommended that the following pattern of financing Regional Coconut Research Stations be adopted:—

- 1) All non-recurring expenditure will be met by the State Governments concerned.

2) For the first fifteen years the Committee will meet 50% of the recurring expenditure, the remaining 50% being met by the State Government.

3) At the end of the 15-year period, the State Governments will take over the Stations completely and bear all the expenses.

The above recommendations were accepted by the Committee.

*Subject No. 14.* Progress report on the Regional Coconut Research Stations Scheme, Kerala State, for the year ended 30-6-1959.

Accepting the Sub-Committee's recommendation, the Committee adopted the report subject to the remark that it should be made obligatory on the part of all Regional Stations to make meteorological observations and to record them in the annual progress reports.

*Subject No. 15.* Proceedings of the Special Sub-Committee for reviewing the future set-up of the Regional Coconut Research Stations in Kerala State.

The Sub-Committee had, while noting the Kerala Government's acceptance of the recommendations of the Special Sub-Committee, recommended that the report be adopted and implemented as early as possible. The Committee endorsed the Sub-Committee's recommendation.

*Subject No. 16.* Progress report on the Regional Coconut Research Station at Arsikere in Mysore State for the year ended 30-6-1959.

The Committee accepted the Sub-Committee's recommendation that the progress report be adopted.

*Subject No. 17.* Progress report on the Regional Coconut Research Station in Madras State for the year ended 30-6-1959.

On the Sub-Committee's recommendation the progress report was adopted by the Committee.



*Subject No. 18.* Progress report on the Regional Coconut Research Station Scheme, Ambajipeta, Andhra Pradesh for the year ended 30-6-1959.

The Sub-Committee, while recommending the adoption of the progress report, had suggested that since the palms were being grown under irrigated conditions, higher doses of manures should be applied. The Committee endorsed the recommendation and the suggestion.

*Subject No. 19.* Regional Coconut Research Station Scheme Ambajipeta, Andhra Pradesh—Proposal for extension of.

In partial modification of the Sub-Committee's recommendation the Committee decided that the term of the Regional Coconut Research Station at Ambajipeta be extended till the end of II Plan on the usual basis at a cost to the Committee not exceeding Rs. 6,330. It was noted that the scales of pay of the staff had been revised in conformity with the general revision of pay-scales in the State.

*Subject No. 20.* Proposal for raising the level of the wet land block at the Regional Coconut Research Station, Ambajipeta (Andhra Pradesh).

On the Sub-Committee's recommendation the Committee approved of the scheme for raising the level of the wet land block at the Regional Coconut Research Station, Ambajipeta.

*Subject No. 21.* Progress report on the Regional Coconut Research Station Scheme, Bhatye, Bombay State for the year ended 30-6-1959.

The Sub-Committee, while recommending the adoption of the progress report, had been of the view that the technical programme of work of the Station was too ambitious and that it should be revised in consultation with the Director and the Joint Director of the Central Coconut Research Stations. The Committee accepted the recommendation.

*Subject No. 22.* Regional Coconut Research Station, Bhatye, Ratnagiri District, Bombay State — Proposal for the extension of.

The Committee accepted the Sub-Committee's recommendation to approve the scheme for the extension of the Regional Coconut Research Station, Bhatye (Ratnagiri District, Bombay State), for one year on the usual basis.

*Subject No. 23.* Regional Coconut Research Station, Ratnagiri, Bombay State — Review of work done at.

The Committee accepted the Sub-Committee's recommendation that the Director, Central Coconut Research Station, Kayangulam, and the Joint Director, Central Coconut Research Station, Kasaragod, be requested to scrutinise the progress of work done so far at the the Regional Coconut Research Station, Ratnagiri.

*Subject No. 24.* Progress report on the Regional Coconut Research Station Scheme at Sakhi-gopal in Orissa State for the years ended 30-6-1958 and 30-6-1959.

The Sub-Committee, while recommending that the progress report be adopted, had been of the opinion that the technical programmes of this and other Regional Coconut Research Stations contained too many items of work and had recommended that the Director, Central Coconut Research Station, Kayangulam, the Joint Director, Central Coconut Research Station, Kasaragod and Shri C. M. John be requested to visit all the Regional Stations and suggest suitable modifications to their technical programmes. The Committee accepted the recommendations.

*Subject No. 25.* Proposal for upgrading the post of Coconut Research and Development Officer, Orissa.

The Sub-Committee had reiterated its previous strong recommendation that a fully trained and experienced officer was required, that being the reason why the upgrading of the post had been approved last year and



had suggested that the President of the Committee may be pleased to deal with the matter in the manner considered appropriate by him. The Committee, however, decided to ask the State Government to advertise the post and to lay down qualifications for it in consultation with the Committee and to co-opt the Secretary of the Committee to the Public Service Commission when selecting a candidate for the post.

*Subject No. 26.* Progress report on Regional Coconut Research Station scheme, Assam, for the period 9-4-1957 to 30-6-1958 and the year ending 30-6-1959.

The Committee adopted the Sub-Committee's recommendation that the progress report be adopted.

*Subject No. 26-A.* Regional Coconut Research Station in Assam – Shifting of site from Rajabari to Kahikuchi – President's sanction – ratification of.

On the Sub-Committee's recommendation the Committee ratified the President's sanction for shifting the site of the Regional Coconut Research Station in Assam from Rajabari to Kahikuchi.

*Subject No. 27.* Progress Report on the Scheme for the Investigation of the Band disease of coconut in Bombay State for the year ended 30-6-1959.

The Committee accepted the Sub-Committee's recommendation that the progress report be approved.

*Subject No. 28.* Scheme for the Investigation of Band Disease of coconut and arecanut-Report of the Special Sub-Committee.

The Committee approved of the Sub-Committee's recommendation that the report of the Special Sub-Committee on the Scheme for the investigation of Band disease of coconut be adopted.

*Subject No. 29.* Progress Report on the scheme for the control of Anabe Roga of coconut in Mysore State for the year ended 30-6-1959.

The Sub-Committee's recommendation that the progress report be approved was accepted by the Committee.

*Subject No. 30.* Scheme for laying out simple Manurial Trials in Coconut Cultivators' gardens — New Scheme.

The Sub-Committee, while recommending in general the adoption of the scheme for laying out simple manurial trials in coconut cultivators' gardens, had been of the view that Assam and West Bengal also should be brought within the purview of the Scheme, and that the assistants to be appointed under the scheme should be graduates in agriculture on the State Governments' scales of pay. It had been further recommended that the actual trials to be carried out in each region should be further discussed by the Statistical Adviser with the appropriate Agronomist and Soil Scientist of the Region.

The Committee endorsed the above recommendations.

*Subject No. 31.* Survey and collection of predatory mites of coconut.

The Committee accepted the Sub-Committee's recommendation that the study of the taxonomy and biology of predatory mites on coconut be undertaken at the Central Coconut Research Station, Kayangulam, and noted that the Director of the Station had indicated his willingness to do so.

*Subject No. 32.* Proceedings of the meeting of the Special Sub-Committee for drawing up the programme of genetical and breeding work at the Central Coconut Research Station, Kasaragod.

The Sub-Committee had considered this to be a very useful report which laid down a sound genetical basis



for future work on the coconut palm and desired to thank Dr. Sikka and the members of the Special Sub-Committee for the contribution they had made. The Sub-Committee had, however, felt that it was now necessary to constitute another Sub-Committee to devise how the various suggestions contained in the report should be allocated between the Central and Regional Stations, what further facilities or staff were required, etc. In other words, the new Sub-Committee should give thought to the best methods of implementing, quickly and effectively, the recommendations, both long-range and of immediate nature, which had been made. It had, therefore, been suggested that a Sub-Committee consisting of Shri C. M. John, Shri C. R. Seshadri, Dr. K.P.V. Menon, Dr. K. M. Pandalai and Shri M. Bhavanisankar Rao be constituted to recommend how best the various suggestions contained in the report could be implemented. This Sub-Committee's report is attached to these proceedings as Annexure II.

Having considered the report the Committee felt that the Sub-Committee had not had sufficient time to do justice to the subject and therefore decided to set up a three-man Sub-Committee consisting of Shri C. M. John, the Director, Central Coconut Research Station, Kayangulam and the Joint Director, Central Coconut Research Station, Kasaragod to make detailed recommendations for implementing the Sikka Sub-Committee's report.

*Subject No. 33.* Indian Central Coconut Committee recruitment rules.

The Committee accepted the Sub-Committee's suggestion to set up a small Sub-Committee to scrutinise the proposals contained in the Secretariat note on the subject, as a number of important issues were involved which required careful consideration.

*Subject No. 34.* Consolidated progress report on Category "A" Research Schemes under the II Five-Year Plan.

The Committee accepted the Sub-Committee's recommendation that the report be adopted.

*Subject No. 34-A.* Development of the Central Coconut Research Station, Kasaragod under the II Five-Year Plan – acquisition of additional land-appointment of special acquisition staff – ratification of President's sanction.

On the Sub-Committee's recommendation the Committee ratified the President's sanction for the appointment of a special staff, at the Committee's cost, for acquiring additional land for the Central Coconut Research Station, Kasaragod.

**Decisions on subjects coming within the purview of the Agricultural Research & Development Sub-Committee (Development & Extension Wing).**

*Subject No. 35.* Action taken on the decisions of the 26th meeting of the Committee on subjects coming within the purview of the Agricultural Research and Development Sub-Committee (Development and Extension Wing).

While taking note of the action taken on the decisions of the 26th meeting of the Committee the Sub-Committee had recommended that in order to make available *Gliricidia* seedlings and cuttings to coconut cultivators, *Gliricidia* plantations be started in all the coconut growing States as follows:—

<i>Name of State</i>	<i>Total area of plantations</i>
Kerala	500 acres
Mysore	300 „
Madras	200 „
Andhra Pradesh	200 „
Bombay	100 „
West Bengal	100 „
Orissa	100 „
Assam	100 „

It had also been recommended by the Sub-Committee

1) that the minimum area covered by a plantation should be not less than 2 acres;



2) that *Gliricidia* bushes should be grown on bunds and borders in the Regional Coconut Research Stations; and

3) that the Director, Central Coconut Research Station, Kayangulam should be co-opted as a member of the Central Supervisory Body for Coconut.

The Committee accepted the above recommendations.

*Subject No. 36.* Proceedings of the Coconut Nursery Officers' Conference held at Mangalore in May 1959.

The Committee accepted the recommendations of the Nursery Officers' Conference and decided that the State Governments be requested to liberalise the delegation of financial powers in order to eliminate delays in the proper running of coconut nurseries.

*Subject No. 37.* Proceedings of the Sixth and Seventh Meetings of the Central Supervisory Body for Coconut.

The Committee, while approving of the decisions of the 6th and 7th meetings of the Central Supervisory Body, decided that in the case of seedlings sold from seednuts supplied at a flat rate of Rs. 400 per thousand F. O. R. destination in West Bengal and Assam, the receipts at the rate of Re. 1 per seedling be shared equally by the Committee and the State Government as in the case of other nursery schemes.

*Subject No. 38.* Scheme for intensive cultivation and manuring of coconuts.

The Sub-Committee while taking note of the calendar of operations in coconut gardens forwarded by the Directors of Agriculture of the coconut growing States had recommended that the Director of Agriculture, West Bengal be requested to amplify the programme of operations in West Bengal and that the whole information be made available to the Extension Wing of the Ministry of Food and Agriculture, Government of India. The recommendation was accepted by the Committee.

The Committee also accepted the President's suggestion that the campaign for intensive cultivation and manuring of coconut should be started in the next rainy season as outlined by the President in his address.

*Subject No. 39.* Attachment of Development Blocks to the Central Coconut Research Stations at Kayangulam and Kasaragod.

The Committee accepted the Sub-Committee's recommendation that Development Blocks be started contiguous to the Central Coconut Research Stations, Kasaragod and Kayangulam and the Regional Coconut Research Stations in the various States so that the results of research work may be passed on to the cultivators and closer understanding between farmers and research workers established.

*Subject No. 40.* Proceedings of the meeting of the Special Sub-Committee for drawing up schemes for conducting mother palms and yield competitions.

The Sub-Committee had considered the rules suggested by the Special Sub-Committee and decided that the competitions should be only for determining the number of mother palms in one-acre competition plots. Each owner can enter any number of such one-acre plots on the payment of a fee of Rupee one for each plot. It was recommended that in areas which are predominantly rain-fed or irrigated the competition should be confined to rain-fed or irrigated plots as the case may be. Only in very rare cases where considerable area is irrigated as well as rain-fed, two separate competitions will be organised for rain-fed and irrigated gardens in the same block or Taluk. Where inter-cropping or under-planting is commonly practised, there will be no bar on this account.

It was considered desirable to select 40,000 mother palms for the four South Indian States of Madras, Mysore, Kerala and Andhra Pradesh. For these States an average out-turn of 20 nuts per mother palm was reckoned as fair estimate. For each of the finally



selected mother palms a prize of Rs. 2 may be awarded. The method of judging the mother palms will be as follows:—

Each entrant should furnish in his application the number of total palms in the competing plot as well as the number of palms which satisfy the criteria prescribed for each unit.

The following criteria are suggested for the mother palms:—

- 1) The tree should have passed the middle age and the crown of the mother palm should be spherical and the leaves should have short and thick petioles and wide leaf bases.
- 2) At any time there should be on the crown a minimum of 12 bunches with a large number of nuts in different stages of development.
- 3) The bunch stalk should be short, stout and strong and should not show any tendency to buckle and droop down.
- 4) The nuts should be medium-sized, round or oblong in shape and the thickness of the kernel should be fairly good.
- 5) Out of mother palms which satisfy conditions 1 to 4 above, only those trees which yield on an average 100 nuts per annum or more would qualify for being entered as mother palms; but in exceptional areas where rain-fall is low, or the soil has a low moisture-retaining capacity as in very sandy areas, this limit of 100 may be reduced to 80 per annum.

For judging the mother palms which have been entered for competition the following procedure is suggested:—

Each of the mother palms selected by the owner will be visited by an experienced Agricultural Assistant during the months of January to May. The District Agricultural Officer will designate a particular month for each taluk and block for judging the yield. During

this month the Agricultural Assistant will visit the orchard of each entrant and make the following records in respect of each mother palm entered for the competition:—

1) The total number of bunches in the crown of a particular tree.

2) The total number of nuts in the six older bunches.

On the basis of the number of nuts in the six bunches the average number of nuts shall be determined. This figure multiplied with the number of bunches recorded under item (1) above will be taken as the yield for the particular palm.

3) Each palm which is deemed to have passed the competition may be marked with prescribed identification marks and numbered.

4) For climbing the trees and counting the nuts and for painting an identification mark a reasonable expenditure which should not ordinarily exceed annas 2 per tree may be allowed.

It was suggested that States which start the scheme within 12 months of the intimation may enjoy the advantage of sharing the expenditure on 75:25 basis instead of 50:50 basis between the Committee and the State. The scheme will be started in Orissa, West Bengal and Assam in the second year after gaining experience in South India.

The Committee, while adopting the above recommendations of the Sub-Committee, also decided to accept the President's suggestions (1) that a prize of Rs. 500 be given to the grower who has the largest number of mother palms in the State; (2) that certificates be issued to growers who have the largest number of mother palms in each district and block and (3) that such prizes be given at specially organised functions so that the owners of such mother palms are honoured and get the widest possible publicity.



*Subject No. 41.* Film on "Growing Coconuts" — preparation of copies with Telugu commentary — ratification of sanction accorded by the President.

The Committee accepted the Sub-Committee's recommendation that the sanction accorded by the President for the production of two copies of the film on "Growing Coconuts" with Telugu commentary be ratified and that the film be produced with commentaries in other regional languages also as and when required. The Committee also accepted the Sub-Committee's recommendation that the State Governments concerned be requested to include in their annual progress reports on coconut development schemes, information regarding the number of times the film on "Growing Coconuts" was screened, the approximate number of people who witnessed it etc.

*Subject No. 42.* Eradication of monkeys — suggestions for.

On the Sub-Committee's recommendation the Committee decided that the State Governments concerned be requested to provide under the Third Five-Year Plan shooting squads on a campaign basis for destroying the monkeys that are causing havoc to coconut palms.

*Subject No. 43.* Progress report on the coconut nursery schemes in Kerala State for the year ended 30-6-1959.

The Committee adopted the Sub-Committee's recommendation that the report be adopted, subject to the observations that there was considerable room to improve the working of the nurseries at Ollukkara, Wadakkancherry, Vaikom and Thodupuzha and that the State Government be requested to take steps to increase the production and distribution of seedlings from these nurseries within the next one year.

*Subject No. 44.* Proposal for the extension of the Coconut Nursery Scheme, Wadakkancherry, Kerala State.

The Committee endorsed the Sub-Committee's recommendations that the period of the coconut nursery

at Wadakkancherry (Kerala State) be extended by one year for the present and that its further extension will depend upon the improvement in its performance.

*Subject No. 45.* Scheme for the establishment of coconut nurseries in National Extension Service Blocks in Kerala State — revised estimates — ratification of President's sanction.

On the recommendation of the Sub-Committee the Committee ratified the sanction accorded by the President for the revised grant-in-aid to National Extension Service Block nurseries in Kerala State.

*Subject No. 46.* Progress report on the comprehensive coconut nursery scheme in Andhra Pradesh for the year ended 30-6-1959.

The Sub-Committee's recommendation that the progress report be adopted was accepted by the Committee.

*Subject No. 47.* Comprehensive coconut nursery scheme in Andhra Pradesh — proposal for the extension of.

The Sub-Committee's recommendation that the scheme be extended from 1-4-1961 to 9-11-1963 subject to the condition that the nursery at Maruteru be shifted and located at a more suitable centre was accepted by the Committee.

*Subject No. 48.* Progress report on the comprehensive coconut nursery scheme, Orissa State for the years ended 30-6-1958 and 30-6-'59.

As recommended by the Sub-Committee the Committee adopted the progress reports.

*Subject No. 49.* Progress report on the coconut nurseries in West Bengal for the year ended 30-6-1959.

The Committee accepted the Sub-Committee's recommendation that the progress report be adopted subject to the observation that the State Government be requested to arrange for future progress reports being



prepared in accordance with the *pro forma* prescribed for progress reports on nursery schemes.

*Subject No. 49-A.* Progress report on the scheme for doubling the production target of coconut nurseries in Kerala State for the year ended 30-6-1959.

On the Sub-Committee's recommendation the progress report was adopted.

*Subject No. 50.* Progress report on the coconut nurseries scheme, Mysore State, for the year ended 30-6-1959.

The Sub-Committee had recommended that the progress report be adopted, observing at the same time that efforts should be made to achieve the targets fixed for the various nurseries and to improve the output of seedlings so as to reduce the cost of production of seedlings particularly at Hebbal and Sanoor where the cost was high at present.

The Committee accepted the recommendation.

*Subject No. 51.* Progress report on the comprehensive coconut nursery scheme, Madras State for the year ended 30-6-1959.

As recommended by the Sub-Committee the progress report was adopted.

*Subject No. 52.* Progress report on Coconut Development scheme in Andhra Pradesh for the year ended 30-6-1959.

The Sub-Committee's recommendation that the report be adopted as a record of good work done during the year was adopted.

*Subject No. 53.* Progress report on the coconut nursery scheme, Nandgaon, Bombay State under the II Five-Year Plan for the year ended 30-6-1959.

The Sub-Committee's recommendation that the report be adopted subject to the remarks that frequent changes of the nursery site should be avoided was accepted by the Committee.

*Subject No. 54.* Progress report on the coconut nurseries at Sakhigopal and Chatrapur, Orissa, under the II Five-Year Plan for the year ended 30-6-1959.

On the Sub-Committee's recommendation the progress report was adopted by the Committee.

*Subject No. 55.* Progress report on the coconut nursery scheme under the II Five-Year Plan in Assam State for the year ended 30-6-'59.

The Sub-Committee had recommended the adoption of the report subject to the observation that future reports should contain full particulars regarding the scheme in accordance with the *pro forma* prescribed for progress reports on nursery schemes.

The recommendation was accepted by the Committee.

*Subject No. 56.* Progress report on the coconut development scheme, Pondicherry, under the II Plan for the year ended 30-6-1959.

The Sub-Committee's recommendations that the report be adopted with the observation that it was a record of good work done in a small area and that the targets for the nurseries be doubled were accepted by the Committee.

*Subject No. 57.* Progress report on the scheme for Coconut Development and Propaganda in Mysore State for the year ended 30-6-1959.

The Committee accepted the Sub-Committee's recommendation that the report be adopted with the observation that the work done in the Bangalore area called for improvement.

*Subject No. 58.* Progress report on the coconut development scheme in Madras State for the year ended 30-6-1959.

The Sub-Committee, while recommending that the progress report be adopted, had suggested that in future



progress reports specific targets for the various items of work under the scheme be mentioned and the actual achievements be recorded. The Committee adopted the recommendation and the suggestion.

*Subject No. 59.* Progress report on the coconut development scheme, Saurashtra, Bombay State for the year ended 30-6-1959.

The Committee accepted the Sub-Committee's recommendation that the progress report be adopted and agreed to its observation that the report revealed a record of good progress made in a small area.

*Subject No. 60.* Progress report on coconut development scheme, Orissa, under the II Five Year Plan, for the year ended 30-6-59.

While recommending the progress report for adoption the Sub-Committee had observed that the report did not mention targets for particular items of work under the scheme and had suggested that in future reports this information should be furnished as well as the actual achievements under each item. The Committee endorsed the recommendation and the observation.

*Subject No. 61.* Progress Report on the scheme for the development of coconut in West Bengal for the year ended 30-6-1959.

The Committee accepted the Sub-Committee's recommendation that the report be adopted with the following observations:-

- 1) that in future reports details of the staff employed under the scheme be shown;
- 2) that the targets aimed at under the various items of work included in the scheme be specifically mentioned;
- 3) that actual achievements in the course of the year under the different items of work be clearly indicated; and
- 4) that the composition of the manure mixture supplied by the State Government to the coconut growers be indicated.

*Subject No. 61-A.* Progress report on the comprehensive Spraying Scheme in Kerala State for the year ended 30-6-1959.

The Sub-Committee in recommending the adoption of the progress report had observed that it was a good record of work done, but had suggested that in future reports the target of the number of sprayings fixed for each District should also be given. The Sub-Committee had also recommended that the Director, Central Coconut Research Station, Kayangulam should in consultation with the Deputy Director of Agriculture for Coconut Development, Kerala State, issue 2000 letters with reply-paid cards, asking a cross section of coconut growers to record and send their impressions regarding the effectiveness of the spraying of coconut palms. The Committee accepted the above recommendations of the Sub-Committee with the modification that the enquiry cards to coconut growers should be issued by the Director of Agriculture, Kerala and not the Director, Central Coconut Research Station, Kayangulam and that the reply-cards should be suitably printed by the Director of Agriculture, Kerala.

*Subject No. 62.* Progress report on the schemes for the biological control of *Nephantis seri-nopa* in Kerala State for the year ended 30-6-1959.

The Committee accepted the Sub-Committee's recommendation that the progress report be adopted with the following observations :—

- 1) that the reason for the reduction in the number of parasites released in the year under report compared to the previous year be ascertained;
- 2) that the Entomologist, Central Coconut Research Station, Kayangulam be requested to visit the Parasite Breeding Stations occasionally to keep in touch with the work done at them; and
- 3) that the effect of releasing parasites on the pest population be ascertained.



The Committee also accepted the President's suggestion that the grower members of the Committee should forward to the Committee their own and other growers' impressions regarding the efficacy of releasing parasites to control *Nephantis serinopa*.

*Subject No. 63.* Progress report on the parasite breeding stations in Madras State for the year ended 30-6-1959.

The Committee accepted the Sub-Committee's recommendation that the progress report be adopted.

*Subject No. 64.* Progress report on the parasite breeding stations in Andhra Pradesh for the year ended 30-6-1959.

On the Sub-Committee's recommendation the report was adopted as a record of good work done.

*Subject No. 65.* Progress report on the scheme for the biological control of coconut mite in Andhra Pradesh for the year ended 30-6-1959.

The Committee adopted the Sub-Committee's recommendation that the progress report be adopted.

*Subject No. 66.* Parasite breeding station scheme, Puri, Orissa State, proposal for-New Scheme.

The Committee accepted the Sub-Committee's recommendations that the scheme be sanctioned for a period of 2 years from 1-4-1960 at a cost to the Committee not exceeding Rs. 6,699 and that a Graduate Assistant be provided for in the scheme as proposed by the State Government.

*Subject No. 67.* Progress report on the scheme for the organisation of demonstration plots in coconut growers' lands in Kerala State for the year ended 30-6-1959.

In recommending the report for adoption, the Sub-Committee had made the following suggestions:-

- i) that the supply of fertiliser mixture be linked up with the spraying of coconut palms in the areas affected by coconut diseases;

- ii) that the mixture be also made available for application to palms in areas not covered by the spraying scheme;
- iii) that out of the quota of ammonium sulphate allotted to the State a certain quantity be made available for coconut mixtures;
- iv) that the mixture be so prepared that it contains a lower proportion of nitrogen, a higher proportion of phosphoric acid (of which half will be in the form of rock phosphate and the other half superphosphate) and some potash; the growers should be advised to use green leaf or green manure and ash to make up the balance of requirements of the palm, and
- v) that loan facilities in respect of these mixtures be given to coconut growers as for other food crops.

The Committee accepted the recommendation and the above suggestions with the modification that the manure mixture may be a 1 : 1 : 2 mixture providing the following nutrients per palm per annum approximately.

N	.35
P <sub>2</sub> O <sub>6</sub>	.35
K	.70

*Subject No. 68.* Consolidated progress report on the coconut development schemes under the II Five-Year Plan.

While recommending the adoption of the progress report, the Sub-Committee had also recommended that the per annum production of seedlings in the nurseries in some of the States be stepped up as shown below.

Kerala	—	from 2.63 lakhs to 4.00 lakhs.
Mysore	— „	1.00 „ 1.50 „
Madras	— „	1.26 „ 2.26 „
Andhra	— „	2.25 „ 3.00 „

The Committee accepted the recommendations.



## Decision on Marketing and Economics Sub-Committee Subjects

*Subject No. 69.* Action taken on the decisions of the 26th meeting of the Committee on subjects coming within the purview of the Marketing and Economics Sub-Committee.

The Committee noted the action taken on the decisions of the 26th meeting of the Committee.

*Subject No. 70.* Pattern of financial assistance for Statistical, Marketing and other Schemes — decision arrived at in the meeting of the Secretaries of the Commodity Committees.

The Committee accepted the Sub-Committee's recommendation that the State Governments concerned be requested to assume full financial responsibility for the Statistical Schemes which they are running at present with financial aid from the Committee, when the period of these schemes is over.

*Subject No. 71.* Collection of Coconut Cess and of Statistics of copra crushed, oil extracted and cake produced — Authorisation of the Committee for enforcement of provisions in Indian Coconut Committee Act 1944 and Rules.

The Committee accepted the Sub-Committee's recommendation that the Government of India be requested to amend the Indian Coconut Committee Act in order to include in it the necessary penal clauses to ensure the timely submission of returns by the mill-owners and the prompt payment of copra cess.

*Subject No. 72.* Indian Standards Institution — Increase in the Committee's Membership subscription.

The Sub-Committee's recommendation that the Committee may continue to be a Sustaining Member of the Indian Standards Institution and pay the enhanced subscription of Rs. 350 per annum was accepted by the Committee.

*Subject No. 73.* Progress Report on the Schemes for correct estimation of area and yield statistics of coconut and arecanut in the States of Kerala, Mysore, Madras, Andhra Pradesh, Bombay, Orissa, West Bengal and Assam.

While adopting the Progress Report, the Committee noted with regret that the Government of West Bengal had not submitted the detailed scheme for the coconut area and yield estimation survey in spite of reminders, but noted with satisfaction that the Government of Orissa had after several reminders started the above mentioned survey in their State.

*Subject No. 73-A.* Import Policy for Coconuts and Coconut Products - April-September, 1960.

Taking into account the imports of copra and coconut oil during the last 5 years, the Sub-Committee had recommended that the total imports of these be restricted to 1,00,000 tons in terms of copra annually.

*Shri B. M. Peter* said that there was no justification to recommend that imports be increased from 50,000 tons in terms of copra to 1,00,000 tons when production of coconuts in the country was going up as a result of the measures adopted by the Committee.

*Shri P. T. John* pointed out that the rate of consumption was greater than the rate of increase in production and that this caused a gap which had to be filled by imports. Imports during the last three or four years had not adversely affected the prices of the indigenous coconut products. This showed that there was scarcity of this commodity in the country and an import of 1,00,000 tons in terms of copra would be the minimum required per annum to meet all demands.

Taking all circumstances into account the Committee decided that the imports be limited to 75,000 tons in terms of copra.



*Subject No. 73-B. Scheme for the Development of Coconut Marketing in Orissa.*

The Committee accepted the Sub-Committee's recommendation that the scheme for the development of coconut marketing in Orissa be sanctioned for a period of one year at a cost to the Committee not exceeding Rs. 3,669.

*General.* The Committee accepted the Sub-Committee's recommendation that the Director of Agriculture, Kerala and the Deputy Director of Agriculture (Coconut Development), Kerala be co-opted to the two wings of the Agricultural Research and Development Sub-Committee, the Marketing and Economics Sub-Committee and the Technological Sub-Committee.

The Agricultural Marketing Adviser had brought to the notice of the Sub-Committee the prevalence of adulteration in edible coconut oil and the Sub-Committee had noted the fact with concern and recommended that immediate steps be taken by the Government of India to popularise the use of graded coconut oil.

The Sub-Committee had also endorsed the view that millers should supply graded coconut oil under AGMARK in suitable containers.

The Committee accepted the above recommendations but decided to record the objections of Messrs. V. J. Joseph and A. R. Sulaiman Sait to millers being asked to supply graded coconut oil under AGMARK in suitable containers.

## **Decisions on Technological**

### **Sub-Committee Subjects**

*Subject No. 74.* Action taken on the decisions of the 26th meeting on subjects coming within the purview of the Technological Sub Committee.

The Committee noted the action taken on the decisions of the 26th meeting of the Indian Central Coconut Committee.

*Subject No. 75.* Co-ordination of Coconut and Arecanut Technology – Suggestion regarding.

The Sub-Committee had felt that most of the coconut technological problems that were proposed to be tackled should be part of the normal work of the Central Food Technological Research Institute, and therefore had recommended that these problems be taken up by that Institute during the Third Five-Year Plan.

The Sub-Committee had also recommended that the Chemical Engineer, Central Coconut Research Station, Kasaragod, be allowed to work at the Central Food Technological Research Institute for a period of six months so that he could make use of the facilities available there for undertaking studies on the storage of copra and coconut oil cake.

The recommendations were accepted by the Committee.

*Subject No. 76* Scheme for effecting improvements in the extraction of oil from copra by rotary and expeller at the Anantapur Institute — New Scheme.

The Committee endorsed the Sub-Committee's observation that the Oil Technological Institute, Anantapur, may take up this scheme for implementation during the Third Five-Year Plan as part of their normal work, if they so desire.

*Subject No. 77.* Recruitment of staff under the Coconut Technological Schemes at the Central Food Technological Research Institute, Mysore and the Regional Research Laboratory, Hyderabad — Ratification of sanction accorded by the President.

The Sub Committee had recommended that the President's sanction for the recruitment of staff under the Coconut Technological Schemes at the Central Food Technological Research Institute and the Regional Research Laboratory, Hyderabad, be ratified.



The Sub-Committee had, however, felt that as the primary and immediate responsibility of the Committee is to take steps to increase the production of coconuts in the country and as the Committee's resources are limited, emphasis should be more on agricultural research and development rather than on technological research. The Sub-Committee had, therefore, recommended that problems of technology relating to coconut may be taken up by the existing technological institutes as a part of their normal work and that the staff recruited for the *ad hoc* technological schemes sanctioned by the Committee, may as far as possible, be absorbed by these Institutes when the present term of these schemes is over.

The Committee accepted the above recommendations.

### **Decisions on Finance Sub-Committee Subjects**

*Subject No. 78.* Action taken on decisions of the 26th meeting on subjects coming within the purview of the Finance Sub-Committee.

In noting the action taken on the decisions of the 26th meeting of the Indian Central Coconut Committee, the Sub-Committee had recommended that the Directors of Agriculture of the various States be requested to purchase and supply copies of "The Coconut Palm — A Monograph" and the "Coconut Atlas of India" to all District Agricultural Officers and that the Block Development Officers of the various coconut growing States also be provided with copies of the books, by the State Governments concerned. The Sub-Committee had also recommended that the Agricultural Colleges be requested to purchase six copies each of the above publications. The Committee accepted these recommendations.

The Committee also decided that a copy each of the Monograph and Atlas might be given to the Co-opted Members of the Committee, free of cost, if they request for them.

*Subject No. 79.* Enhanced powers delegated to the Secretary regarding grant of honorarium — cancellation of earlier orders of the Government of India.

The Committee took note of the fact that the Government of India had on further consideration decided to drop their earlier suggestion to enhance the power of the Secretary in the matter of granting honoraria.

*Subject No. 80.* Delegation of powers to the Secretary, Indian Central Coconut Committee— Enhancement of — decisions arrived at in the meeting of the Secretaries of the Commodity Committees.

The Committee accepted the Sub - Committee's recommendation that the revised list of powers proposed to be delegated to the Secretary of the Committee as in column 5 of annexure II of Secretariat note be approved subject to the modification that the Secretary's power to suspend Officers and staff of the Committee be limited to the staff that he is competent to appoint.

*Subject No. 81.* Central Coconut Research Station, Kayangulam - continuance of the post of Electrician on long-term basis.

The Committee adopted the Sub-Committee's recommendation that the Government of India be addressed to sanction the post of Electrician at the Central Coconut Research Station, Kayangulam, on a long-term basis from 6-11-1960.

*Subject No. 82.* Scheme for the establishment of 3 Regional Coconut Research Stations in Kerala State — Grant-in-aid statement and audit certificate for the year 1954-55.

On the Sub-Committee's recommendation the Committee adopted the revised grant-in-aid statement and audit certificate for the year 1954-55 in respect of the Scheme for the establishment of Regional Coconut Research Stations in Kerala.



*Subject No. 83.* Coconut cess, Sales tax and fees to Regulated Market Committees — clubbing with Central Excise Duty — request for.

The Committee accepted the Sub-Committee's recommendation that Shri P.B. Kurup's suggestion, namely, levies such as Central Excise Duty, Sales Tax, Coconut Cess, Regulated Market fees etc. at present collected by different agencies may be arranged to be collected by the Central Excise Department, be referred to the Central Board of Revenue.

*Subject No. 84.* Recommendations of the Sub-Committees other than the Finance Sub-Committee having financial commitments.

The following financial commitments arising out of decisions taken in the Agricultural Research & Development Sub-Committee (Research and Development Wings) and the Marketing and Economics Sub-Committee were approved by the Committee:—

Subject No.	Details	Expenditure Rs.	Receipts Rs.
<i>Agricultural Research &amp; Development Sub-Committee (Research Wing)</i>			
19.	Regional Coconut Research Station Scheme, Ambajipeta, Andhra Pradesh,—Proposal for extension of —	9,830	3,500
20.	Proposal for raising the level of the wet land block at the Regional Coconut Research Station, Ambajipeta, Andhra Pradesh.	10,415	6,612
22.	Regional Coconut Research Station, Bhatye, Ratnagiri District, Bombay State — Proposal for extension of	10,450	500

28.	Scheme for the investigation of the <i>Band</i> Disease of Coconut and Arecanut—Report of the Special Sub-Committee.	94,282.66	Nil
30.	Scheme for laying out simple manurial trials in coconut cultivators' gardens.	1,47,900	Nil
	<i>Agricultural Research &amp; Development Sub-Committee (Development Wing)</i>		
44.	Proposal for the extension of the Coconut Nursery Scheme, Wadakkancherry, Kerala State.	1,561	712
47.	Comprehensive Coconut Nursery Scheme in Andhra Pradesh — Proposal for the extension of.	16,650	13,409
66.	Parasite Breeding Station Scheme, Puri, Orissa — Proposal for.	6,699	Nil
	<i>Marketing &amp; Economics Sub-Committee</i>		
73-B.	Scheme for the Development of Coconut Marketing in Orissa	3,669	Nil
<i>Subject No. 85.</i>	Authorisation of a member of the Finance Sub-Committee to discharge certain functions.		

The Committee passed the following resolution:—

Resolved to authorise Shri B. M. Peter, a member of the Finance Sub-Committee to exercise the functions specified in Sub-Rule (5) of Rule 23 of the Indian Central Coconut Committee Rules 1945 from the 1st May 1960.

In his concluding remarks, the President, Dr. Randhawa, observed as follows:—

I have now great pleasure to thank Dr. J. S. Patel, Agricultural Commissioner for the contribution he has made to the deliberations of this meeting. He has, as



you may know, the unique advantage of having served in three States. He is also the author of "The Coconut—A Monograph". He is thus eminently fitted to tackle problems connected with the coconut crop. He has made a number of useful suggestions for which we are grateful to him.

Our thanks are also due to Dr. Pal in equal measure. He always brings to bear on the problems discussed a fresh mind and I am glad that he found time to attend our meeting and give us some very valuable suggestions.

We have to thank also a number of veterans like Shri P. D. Nair and Shri C. M. John, who have given us the benefit of their wide experience. I feel that we must continue to associate them with the Committee as long as they are alive. Shri R. Srinivasa Iyer, Shri K. P. Amrithanatha Iyer, Shri P. B. Kurup and Shri P. T. John all have made valuable contributions to the discussions and our thanks are due to them.

To Shri Raja Ram, Secretary to the Government of Madras our thanks are specially due for the arrangements made to hold our meetings in this College and to Dr. S. Krishnamurthi for the splendid hospitality we have received at his hands. Never before in its history has the Committee received such lavish hospitality.

I would also thank Dr. Gregory, the Secretary and his staff for having organised this meeting so efficiently and express the hope that the decisions of this meeting will be followed up with the same efficiency.

With a vote of thanks to the President proposed by Shri R. Srinivasa Iyer, the meeting came to a close at 12-30 P.M.

The meeting was followed by a group photo and the screening of the film on "Growing Coconuts" produced by the Committee.

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## ANNEXURE I

Report of the Special Sub-Committee constituted for drawing up the programme for the production of hybrid (T x D) seedlings (Subject No. 8).

The Special Sub-Committee consisting of Shri C. M. John, Dr. K. M. Pandalai and Messrs. Bhavanisankar Rao, M. P. Narasimha Rao and D. P. Lakshminarasimhaiah met and the following programme for the production of hybrid (T x D) seedlings was drawn up.

The Sub-Committee examined the question of production of large number of T x D hybrids for supply to the Regional Coconut Research Stations from the Central Coconut Research Station, Kasaragod. It is understood that there are at present only about 30 good mother palms having transmittible characters and compatible for crossing with Dwarf variety for the production of economic hybrids. This being the limiting factor, it would be possible to produce during the season only about 1000 good seedlings per year. The work may therefore start with this set of parents and enlarged in due course after more compatible parents are spotted out. Since this would take considerable time, it would be worth-while exploring the possibility of correlating certain mother palm characters compatible for crossing between T and D parents. Expression of pigmentation, bearing nature, nut shape, nut size, nature of crown etc. in the existing progenies as compared to the parental characters may probably give certain indications in this direction.

Since the number of hybrids will be very much limited it would be necessary to have a phased programme of trial in the Regional Coconut Research Stations. The number of TxD hybrid seedlings supplied should however be sufficient for a statistical lay out in the regions concerned. Since this work is a very important one it is suggested that a Research Assistant, (Grade I) a Fieldman and two trained malies (tree climbers) should be provided for in the scheme for a period of three years at



Kasaragod. The Expenditure in this connection would amount to about six thousand rupees per year.

Sd. C. M. John

K. M. Pandalai

M. Bhavanisankar Rao

M. P. Narasimha Rao

D. P. Lakshminarasimhaiah

## ANNEXURE II.

Report of the Special Sub-Committee constituted for drawing up the programme of genetical and breeding work at the Central Coconut Research Station, Kasaragod.

The Special Sub-Committee consisting of the following members

Shri C. M. John

Shri C. R. Seshadri

Dr. K. P. V. Menon

Dr. K. M. Pandalai and

Shri M. Bhavanisankar Rao

met and considered how best the report could be implemented. The Sub-Committee could only make the following general suggestions for implementation. They regret that it is not possible to give full details regarding the space, staff required etc. for the purpose since adequate information on the number of palms and progenies that would be involved in the scheme and the space available at different stations for this purpose is not readily available.

- (1) *Introduction of different varieties from other coconut growing countries and assessment of their economic characters.*

The varieties that have already been introduced at Pilicode and Kasaragod should be strictly assessed for their relative economic characters. The seedlings obtained from promising ones should be distributed for trial in the first instance to the Regional Research Stations in Assam, Orissa, Andhra Pradesh, Bombay, Mysore and Madras. The number of seedlings should be sufficient to enable a statistical lay out. Since the planting material will be limited for distribution to all the Regional Stations at the same time, a phased programme

of supply covering a 2 to 3-year period may be adopted, preference being given in the first instance to those Regional Stations which are located in entirely different soil climatic regions.

The newly introduced exotic varieties which appear to be promising in the seedling stages should also be tried in the Regional Stations before a complete assessment of their adult tree performance is available, so as to save time. Large number of seednuts of these varieties sufficient for a statistical lay out may be obtained from the respective sources. If surface transmission of the seednuts has affected the germination, arrangements may have to be made for air transport.

(2) *Selection of mother palms and their progeny testing.*

Work in this direction should be started with selected mother palms which have already shown genetic transmissibility of characters relating to high yield. An estimate of the number of such mother palms, the progenies that could be obtained in each season and phased programme of trial both at the Central Coconut Research Station, Kasaragod and the Regional Research Stations should be worked out and an estimate of the area required for this purpose at each of the centres of trial made so that provision of land and facilities would become available in the course of 2 or 3 years, when the planting material is expected to be ready for transplantation in fields. This work should receive high priority.

(3) *Study of crosses between exotic and Indian varieties using selected "Tall" mother palms.*

Work in this direction is already in progress and progenies of mother palms which are good transmitters are available at Kasaragod as well as at Pilicode and Nileshwar. Based on the observations already made desirable parents for crossing work should be selected and crosses effected. The space that would be required for this purpose will also depend upon the number of parents and crosses that will have to be done during the coming years.



(4) *Study of T x D Crosses*

This work should be taken up immediately. In view of the limited number of pollen parent of having good transmittible characters an endeavour should be made to preserve the pollen of desirable parents in a viable condition for a longer period. If the pollen could be preserved for a longer period than what is possible at present it should be possible to supply pollen of desirable parents even to Regional Stations for crossing work.

(5) *Paired Crosses*

This project is workable only after fixing sufficient numbers of prepotents. However, parents, progenies of which have shown commendable performance in previous years could be used for initiating this project.

(6) *Evolution of inbred lines and making of single crosses*

Since some of the inbred lines of Kasaragod parents are available only at Pilicode Station a scheme of co-ordinated work between the Botanist of Kasaragod and the Officer-in-charge of the Pilicode Station under the Kerala Government would be necessary. It should be possible to finance the scheme wholly by the Indian Central Coconut Committee.

(7) *Study of 3-way and double crosses*

The material for the study is now available at Pilicode and a co-ordinated scheme of work between Kasaragod and Pilicode would be necessary for this purpose.

(8) *Introduction of spicata character in the local "Tall" variety*

Breeding work in this direction may be undertaken. Side by side with this cytological studies relating to inheritance of spicata character should also be undertaken and the nature of inheritance of this spicata character in the progenies investigated.

(9) *Breeding for pest and disease resistance*

This work in a crop like coconut may not offer any great prospect. However an attempt may be made to

study the relative resistance of the selected outstanding varieties which have already been collected by growing them amidst the disease and pest infected gardens at Kayangulam. A field having diseased coconut palms may be underplanted with seedlings of the varieties, both Indian and exotic, under a statistical lay out in consultation with the Statistical Adviser to the Indian Council of Agricultural Research.

(10) *Study of correlation between different characters.*

This work should be intensified as suggested by the Sub-Committee taking advantage of the organisation of a statistical section at the Central Coconut Research Station, Kasaragod. It would be necessary to consult the Statistical Adviser in this matter to see that the method adopted is sound.

(11) *Induction of haploidy and development of genetically pure forms through chromosome doubling of haploids.*

This work may be taken up as suggested by the Sub-Committee.

(12) *Studies on vegetative reproduction of coconut palm.*

Although this work does not offer immediate prospects of large scale propagation, the trials undertaken at Kayangulam and Kasaragod in this direction should be elaborated. New techniques using hormones and auxins should be attempted in palms of different ages during different seasons of the year.

(13) *Establishment of a progeny orchard of the local tall variety.*

This work should be taken up as suggested by the Sub-Committee.

### GENERAL

Since some of the material required for implementing the programme of work enumerated above are available at the Coconut Research Stations, Pilicode and Nileshtar now under the Kerala Government and it would take considerable time to duplicate them at Kasaragod, it is suggested that a co-ordinated programme of breeding and progeny studies be undertaken under the



direct auspices of the Indian Central Coconut Committee by providing necessary staff (an assistant Botanist, one Research Assistant and a Fieldman) at Pilicode to work under the technical control of the Botanist at the Central Coconut Research Station, Kasaragod who will draw up a technical programme. It is presumed that the Kerala Government would not have any objection for the Indian Central Coconut Committee taking this work, necessary compensation being given to the Kerala Government for the loss of any income that may accrue as a result of the implementation of the programme. The scheme may have to be run for a period of not less than 10 years to start with. The Kerala Government may be approached sufficiently early so that the work could be launched within the course of a year or two.

It may be recommended in this connection that the Coconut Research Stations, Kasaragod, Pilicode, Nileshtar II and III formed one unit of Coconut Research of Madras Department of Agriculture and it was only with the inauguration of the Indian Central Coconut Committee, that the Kasaragod Station was taken over by the Committee, the three others being left with the Madras Government. With the re-organisation of the States, these three Stations passed on to the Kerala Government. Since the Central Research Stations of the Coconut Committee and these three Coconut Research Stations, namely Pilicode, Nileshtar II and III are located in Kerala State, within a short distance of 25 miles and the Kerala Government is very much interested in the improvement of coconut in this country, no difficulty in implementing a co-ordinated breeding programme for Kasaragod, Pilicode and Nileshtar is visualised.

Sd. C. M. John  
C. R. Seshadri  
K. P. V. Menon  
K. M. Pandalai  
M. Bhavanisankar Rao

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## APPENDIX I

### Secretary's Note

*Subject No. 6.* Proceedings of the meeting of the Finance Sub-Committee held on the 19th September 1959.

A meeting of the Finance Sub-Committee of the Committee was held on the 19th September, 1959 in the office of the Committee at Ernakulam. A copy of the proceedings of that meeting is attached to this note (Appendix I).

The latest position regarding the action taken on the more important decisions of that meeting are indicated below:—

*Subject No. 1.* Nomination of a member to the Finance Sub-Committee.

The President of the Committee has approved of the decision to appoint Shri P.D. Nair, Agricultural Adviser, Kerala State to fill the vacancy in the Finance Sub-Committee caused by the resignation of Shri K. Sivasankara Menon, resigned.

*Subject No. 2.* Audited statement of accounts of the Committee for 1956-57.

The audited statement of accounts has been forwarded to the State Governments concerned with the request that it might be published in their Official Gazettes.

*Subject No. 3.* Revised Budget Estimates of the Committee for the year 1959-60 and Budget Estimates for the year 1960-61 (Part I).

And

*Subject No. 4.* Revised Budget Estimates of the Committee for the year 1959-60 and Budget Estimates for 1960-61 (Part II).

The Budget Estimates (Parts I & II) and Revised Budget Estimates (Parts I & II) of the Committee have been revised in the light of the decisions taken by the



Finance Sub-Committee and submitted to the Government of India for approval. Copies of these as submitted to the Government of India are attached to this note (Appendix II).

*Subject No. 5.* Indian Central Coconut Committee Provident Fund Rules - revision of.

The revised rules have been forwarded to the Government of India for their approval. A copy of the rules as revised is attached to this note as Appendix III.

*Subject No. 6.* Amendments to Rule 21 of the Indian Central Coconut Committee Rules, 1945.

The amendments to Rule 21 of the Indian Central Coconut Committee Rules recommended by the Sub-Committee will be forwarded to the Government of India after they have been approved by the full Committee at this meeting.

*Subject No. 9.* Temporary posts of clerk and peon in the Committee's office - continuance on long-term basis of.

The Government of India have been requested to approve the Sub-Committee's decision to continue the 2 posts of clerk and 2 posts of peon for the Committee's office on a long-term basis.

*Subject No. 10.* Authorisation of President and Secretary of the Committee to sign agreements by Messrs. M. C. Nambiar and J. Antony, Research Assistants (Selection Grade) to serve the Committee for certain periods for getting training at the Committee's expense.

The Sub-Committee had decided that in the case of Shri J. Antony, Research Assistant, the minimum period of three years stipulated for serving the Committee, might be reduced to one year and three months. The President of the Committee has been requested to approve of the decision.

*Subject No. 13.* Central Coconut Research Station, Kasaragod - Shri P. K. Thomas, permanent Research Assistant (Grade I) on

deputation to Indian Agricultural Research Institute - Refund of Rs. 960.00 paid in lieu of 3 months' notice.

The Sub-Committee's decision has been intimated to Shri P. K. Thomas.

*Subject No. 15.* Shri C. J. John, permanent clerk in the office of the Committee on deputation as Stenographer in the office of the Officer on Special Duty (Spices) - Grant of lien to on clerk's post.

The Sub-Committee's decision to extend the lien for 2 more years from 1-5-1959 has been communicated to Shri C. J. John.

*Subject No. 16.* Central Coconut Research Station, Kayangulam - temporary post of clerk - continuance on long-term basis - proposals for.

The Government of India have been requested to approve the Sub-Committee's recommendation for the continuance on a long-term basis the temporary post of clerk at the Central Coconut Research Station, Kayangulam.

*Subject No. 17.* Central Coconut Research Station, Kayangulam conversion into a room of the verandah of the quarters occupied by a fieldman - President's sanction - ratification of.

The Sub-Committee's decision has been communicated to the Director, Central Coconut Research Station, Kayangulam.

*Subject No. 18.* Central Coconut Research Station, Kayangulam providing an additional room for the quarters occupied by Shri K. N. Sahasranaman, Farm Assistant - sanction for.

The Sub-Committee's decision has been duly communicated to the Director, Central Coconut Research Station, Kayangulam for implementation.



*Subject No. 19.* Scheme for the supply of seed coconuts to the State Governments.

The sanction of the Government of India for the modified scheme has been applied for.

*Subject No. 20.* Sample surveys for the correct estimation of area and yield of coconuts and arecanuts – financial aspects – consideration of.

The revised statements of expenditure of the schemes for conducting sample surveys for the correct estimation of area and yield of coconuts and arecanuts in the States have been called for from the State Governments concerned and they are awaited.

*Subject No. 26.* Office of the Indian Central Coconut Committee – Extension of the period of deputation of Shri M. S. Venkataraman, Statistician and Sarvashri K. S. Ananthasubramony and K. Raman Menon, Office Superintendent and Accountant respectively.

The Sub-Committee's decision to extend the period of deputation under the Committee of the above officers has been communicated to the State Governments concerned.

*Subject No. 27.* Scheme for the investigation of the "Band" disease of the coconut palm in Bombay State – proposal for the continuance of.

The sanction of the Government of India for the continuance of the scheme from 15-1-1960 has been applied for.

*Subject No. 28.* Regional Coconut Research Stations in Kerala State – proposal for the extension of.

The Government of India's sanction for the extension of the above scheme for a period of 3 years from 23-12-1959 has been applied for.

The Proceedings of the meeting of the Finance Sub-Committee are for the information of the full Committee.

Proceedings of the meeting of the Finance Sub-Committee of the Indian Central Coconut Committee held at 10.30 A.M. on 19th September, 1959 at Ernakulam.

The following were present :—

1. Shri K. P. Madhavan Nair — *Chairman.*
2. „ P. B. Kurup
3. „ V. Eacharan
4. „ C. H. Lingadevaru
5. „ V. J. Joseph
6. „ A. R. Sulaiman Sait
7. Dr. P. J. Gregory — *Secretary.*

*Visitors*

1. Dr. K. P. V. Menon — Director, Central Coconut Research Station, Kayangulam.
2. Dr. K. M. Pandalai — Joint Director, Central Coconut Research Station, Kasaragod.

*Subject No. 1.* Nomination of a member to the Finance Sub-Committee.

The Sub-Committee decided that Shri P. D. Nair, Agricultural Adviser, Kerala State be appointed to fill the vacancy in the Finance Sub-Committee caused by the resignation of the Director of Agriculture, Kerala State.

*Subject No. 2.* Audited Statement of Accounts of the Committee for 1956-'57.

The sub-Committee approved of the Receipts and Payments Account of the Committee for 1956-'57, and the Receipts and Payments Account and Income and Expenditure Account of the Committee's Provident Fund for 1956-'57 and the Balance Sheet of the Fund as on 31-3-1957.

The Sub-Committee also decided that the State Governments nominating members to the Committee be requested to publish the Inspection Report and the audited statement of accounts in their official gazettes.



*Subject No. 3.* Revised Budget Estimates of the Committee for the year 1959-'60 and Budget Estimates for the year 1960-'61 (Part I).

The Sub-Committee approved of the Revised Budget Estimates for 1959-'60 and Budget Estimates for 1960-'61 (Part I) subject to the modification that the provisions under the head "Laboratory Equipments" in the Revised Budget Estimates for 1959-'60 and Budget Estimates for 1960-'61 of Central Coconut Research Station, Kasaragod be reduced to Rs. 10,000.00 and Rs. 32,500.00 respectively.

The Sub-Committee also authorised the Secretary to revise the Part I Estimates of the 2 years in the light of the decisions taken by the Sub-Committee.

*Subject No. 4.* Revised Budget Estimates of the Committee for the year 1959-'60 and Budget Estimates for 1960-'61 (Part II).

The Sub-Committee approved of the Revised Budget Estimates for 1959-'60 and Budget Estimates for 1960-'61 (Part II) subject to the remark that a provision of about Rs. 12 lakhs be made for expenditure during the year 1960-'61 and that the provisions now suggested under certain heads in Annexures IV and V of the Secretary's note on the subject be amended as below:—

**Annexure IV (Central Coconut Research Station,  
Kasaragod)**

	Revised Budget Estimates for 1959-'60	Budget Estimates for 1960-'61
a) <i>Non-recurring expenditure</i>		
3. Buildings - Residential ) and Non-residential )		1,00,000.00 (for additional staff quarters).
4. <i>Stores</i>		
(iii) Laboratory Equipments	21,500.00	35,800.00

# Annexure V (Central Coconut Research Station, Kayangulam)

## a) *Non-recurring expenditure*

3. Buildings – Residential ) and Non-residential )	—	50,000.00 (for staff quar- ters)
4. <i>Stores</i>		
(i) Farm Implements etc.	—	1,02,000.00
(ii) Laboratory Equipments	—	1,35,000.00 (This includes Rs. 1 lakh for tracer work equipments)

## b) *Recurring Expenditure*

3. Other Charges	—	60,000.00
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The Sub-Committee also authorised the Secretary to make the necessary revision in the Part II Budget Estimates and Revised Budget Estimates in the light of the decisions taken by the Sub-Committee.

*Subject No. 5.* Indian Central Coconut Committee Provident Fund Rules — Revision of.

The Sub-Committee decided that the suggestions as per the Secretariat note on the subject for modifying the existing rules in the light of the model rules forwarded by the Government of India, be approved.

*Subject No. 6.* Amendments to Rule 21 of the Indian Central Coconut Committee Rules 1945.

The Sub-Committee recommended that Rule 21 of the Indian Central Coconut Committee Rules be modified in such a way that the Committee is allowed to sanction expenditure not exceeding Rs. 5,000.00 on any one or a number of minor schemes which are not anticipated at the time of framing the annual Budget Estimates of the Committee subject to the condition that the schemes are connected with the approved objects and the pattern of assistance is the same as approved by



the Government of India for similar schemes and further the expenditure in question is met by diverting savings etc., from within the sanctioned Budget of the Committee.

*Subject No. 7.* Indian Central Coconut Committee Provident Fund — Fixation of rate of interest for the year 1959-'60.

The Sub-Committee decided that the rate at which interest is to be credited to the accounts of the subscribers to the Committee's Provident Fund for the year 1959-'60 might be fixed at 3.75% per annum which is the rate fixed by the Government of India.

The Sub-Committee also agreed to make a special contribution not exceeding Rs. 4,700.00 to the Fund to enable payment of interest at the above rate.

*Subject No. 8.* Excise Duty on Coconut Oil — Abolition of the exemption limit of 125 tons of coconut oil produced per annum.

The Sub-Committee noted the Government of India's decision to withdraw the slab exemption relating to Excise Duty on vegetable non-essential oils.

*Subject No. 9.* Temporary posts of Clerk and Peon in Committee's office — continuance on long-term basis of.

The Sub-Committee decided that the two posts of Clerk and 2 posts of peon sanctioned for a period of 5 years by the Indian Central Coconut Committee at its 21st meeting for the Committee's office might be continued on a long-term basis to cope with the increasing volume of work.

*Subject No. 10.* Authorisation of President and Secretary of the Committee to sign agreements by Messrs. M. C. Nambiar and J. Antony, Research Assistants (Selection Grade) to serve the Committee for certain periods for getting training at the Committee's expense.

The Sub-Committee authorised, under Rule 15 (3) of the Indian Central Coconut Committee Rules, 1945, the President and Secretary of the Committee to sign on behalf of the Committee, agreements executed by members of the staff to serve the Committee for certain periods after getting training at the Committee's expense.

Dr. K. P. V. Menon, Director, Central Coconut Research Station, Kayangulam, pointed out that the minimum period of 3 years stipulated in the case of Shri J. Antony for serving the Committee was comparatively long as the duration of his training was only six weeks. He, therefore, suggested that it might be reduced to one year and three months. The Sub-Committee approved of the suggestion.

*Subject No. 11.* Handbook on coconut cultivation — Sale through Directors of Agriculture of the coconut-growing States.

The Sub-Committee decided to ratify the sanction accorded by the President of the Committee for meeting the expenses on Money Order Commission, packing and forwarding charges etc., out of the sale proceeds of the Handbook on "Coconut Cultivation" when copies of the book are sold through the State Directors of Agriculture.

*Subject No. 12.* Central Coconut Research Station, Kasaragod — grant of lien to Shri P. K. Thomas on the post of Research Assistant (Grade I).

The Sub-Committee decided that Shri P. K. Thomas be granted lien on his substantive post under the Committee for one year more from 1-4-1959 on the existing terms and conditions.

*Subject No. 13.* Central Coconut Research Station, Kasaragod — Shri P. K. Thomas, permanent Research Assistant (Grade I) on deputation to Indian Agricultural Research Institute—refund of Rs. 960.00 paid in lieu of 3 months' notice.



The Sub-Committee decided that the sum of Rs. 960.00 paid to the Committee by Shri. P. K. Thomas in lieu of three months' notice need not be refunded to him as according to the terms of his appointment to the post of Soil Survey Officer, Shri Thomas should give 3 months' notice or 3 months' pay and allowance in lieu thereof, if he wanted to get relieved from that post.

*Subject No. 14.* Central Coconut Research Station, Kayangulam - Shri C. P. Ramachandran, Laboratory Assistant in Entomology - Registration for M. Sc. Degree (by Research) of the Kerala University.

The Sub-Committee decided that Shri C. P. Ramachandran might be permitted to get his name registered as a candidate for M. Sc. Degree by research and to utilise the data collected by him in the course of his work for the preparation of his thesis.

The Sub-Committee also accorded permission to Dr Chandy Kurian, Entomologist, Central Coconut Research Station, Kayangulam to supervise the work of Shri Ramachandran for the M. Sc. Degree.

*Subject No. 15.* Shri C. J. John, permanent Clerk in the office of the Committee on deputation as Stenographer in the office of the Officer on Special Duty (Spices) - Grant of lien to on Clerk's post.

The Sub-Committee decided that Shri C. J. John might be granted extension of lien on his substantive post under the Committee for two more years from 1-5-1959 on the existing terms and conditions.

*Subject No. 16.* Central Coconut Research Station, Kayangulam-Temporary post of Clerk-continuation on long-term basis - proposals for.

The Sub-Committee decided that the Government of India might be requested for permission to continue on a long-term basis the temporary post of Clerk sanctioned by the Committee for a period of 5 years

from 1-4-1955 for the office of the Central Coconut Research Station, Kayangulam.

*Subject No. 17.* Central Coconut Research Station, Kayangulam—conversion into a room of the verandah of the quarters occupied by a Fieldman—President's sanction—ratification of.

The Sub-Committee decided to ratify the sanction accorded by the President for converting into a room the open verandah of the quarters occupied by Shri P. K. Pavithran, Fieldman, Central Coconut Research Station, Kayangulam at an estimated cost of Rs. 165.00.

The Sub-Committee also decided that rent might be collected from the occupant of the quarters on the basis of the increased capital cost of the building from the date of completion of the work.

*Subject No. 18.* Central Coconut Research Station, Kayangulam—providing an additional room for the quarters occupied by Shri K. N. Sahasranaman, Farm Assistant—sanction for.

The Sub-Committee approved of the proposal to provide an additional room for the quarters occupied by Shri K. N. Sahasranaman, Farm Assistant, Central Coconut Research Station, Kayangulam at a cost of Rs. 375.00.

The Sub-Committee also decided that rent, in accordance with the increased capital cost of the building, might be collected from the occupant of the house from the date of completion of the work.

*Subject No. 19.* Scheme for the supply of seed coconuts to the State Governments.

The Sub-Committee approved of the modified Five-Year Scheme submitted by the Joint Director, Central Coconut Research Station, Kasaragod, for the supply of seed coconuts to the States of West Bengal and Assam subject to the following conditions:—

- (1) That the selling price of seedlings produced in the grant-in-aid nurseries in West Bengal and



Assam be raised to Re. 1.00 each from 50 naye Paise.

- (2) That in the case of seedlings produced from seednuts supplied under the present scheme, the extra receipts at the rate of 50 naye Paise per seedling be remitted to the Committee to reimburse the expenditure incurred by the Committee for transporting the seednuts to West Bengal and Assam, and that the remaining receipts at 50 naye Paise per seedling be shared by the State Government and the Committee or the Government of India, as the case may be, on the usual basis.
- (3) That the entire receipts at Re. 1.00 per seedling realised by sale of seedlings produced from seednuts procured otherwise than under the present scheme be shared by the State Government and the Committee or the Government of India, as the case may be, on the usual basis.

*Subject No. 20.* Sample surveys for the correct estimation of area and yield of coconuts and arecanuts – financial aspects – consideration of.

The Sub-Committee authorised the Secretary of the Committee to approach the Government of India for sanction of the revised schemes for conducting sample surveys for the correct estimation of area and yield of coconuts and arecanuts, when received from the State Governments, limiting the total recurring expenditure for 1958-'59 to 1960-'61 to amounts already sanctioned by the Government of India.

*Subject No. 21.* Ratification of action in making local purchase of stationery.

The Sub-Committee ratified the action taken by the Secretary of the Committee in purchasing 50 reams of duplicating paper from Messrs. Gestetner Duplicators (Private) Ltd., at a cost of Rs. 365.75.

*Subject No. 22.* Scheme for the establishment of Zonal Parasite Breeding Station at Kasaragod to control *Nephantis serinopa* — Grant-in-aid statement and audit certificate for the year 1956-'57.

The Sub-Committee approved of the grant-in-aid statement and audit certificate for the year 1956-'57 relating to the scheme for the establishment of a Zonal Parasite Breeding Station at Kasaragod to control *Nephantis serinopa*.

*Subject No. 23.* Scheme for the establishment of Parasite Breeding Stations for the biological control of *Nephantis serinopa* in Travancore-Cochin — Grant-in-aid statement and audit certificate for the year 1956-'57.

The Sub-Committee approved of the grant-in-aid statement and audit certificate for 1956-'57 in respect of the scheme for the establishment of Parasite Breeding Stations for the biological control of *Nephantis serinopa* in Travancore-Cochin.

*Subject No. 24.* Scheme for the development of coconut cultivation in West Bengal—Grant-in-aid statement and audit certificate for 1952-'53.

The Sub-Committee approved of the grant-in-aid statement and audit certificate for 1952-'53 relating to the scheme for the development of coconut cultivation in West Bengal.

*Subject No. 25.* Scheme for the appointment of Coconut Propaganda Officer and staff in Travancore-Cochin — Grant-in-aid statement and audit certificate for the year 1954-'55.

The Sub-Committee accepted the grant-in-aid statement and audit certificate for the year 1954-'55 relating to the scheme for the appointment of Coconut Propaganda Officer and Staff in Travancore-Cochin State.



*Subject No. 26.* Office of the Indian Central Coconut Committee — Extension of the period of deputation of Sri M. S. Venkataraman, Statistician and Sarvashri K. S. Ananthasubramony and K. Raman Menon, Office Superintendent and Accountant respectively.

The Sub-Committee decided that the period of deputation under the Committee of Sarvashri K. S. Ananthasubramony, M. S. Venkataraman and K. Raman Menon be got extended on the existing terms and conditions for a further period of 3 years from 1-5-1960, 13-3-1960 and 1-5-1960 respectively or till the date of their superannuation, whichever is earlier.

*Subject No. 27.* Scheme for the investigation of the "Band" disease of the coconut palm in Bombay State—proposal for the continuance of.

The Sub-Committee decided that the existing scheme for the investigation of the "Band" disease of coconut palm might be continued from 15-1-1960 on the existing terms and conditions till the revised scheme is started.

It was also decided that the necessary provision for one year might be made in the Committee's Budget for continuing the existing scheme.

*Subject No. 28.* Regional Coconut Research Stations in Kerala State—proposal for the extension of.

The Sub-Committee decided that the Regional Coconut Research Stations at Kumarakom and Neyyattinkara in Kerala State might be continued on the existing staff pattern and scales of pay of staff for a period of 3 years from 22-12-1959, the Committee meeting 33-1/3% of the recurring expenditure on the scheme during the extended period.

With a vote of thanks to the Chair, the meeting terminated at 1 P. M.

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# APPENDIX II

## ANNEXURE I

### Indian Central Coconut Committee

Revised Budget Estimates for 1959-'60 and Budget Estimates for 1960-'61

(Part I)

#### Receipts

Particulars	Actuals 1957-'58	Actuals 1958-'59	Sanctioned Budget 1959-'60	Revised Estimates 1959-'60	Budget Estimates 1960-'61
	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.
To opening balance	2,47,232.41	4,06,109.52	8,87,465.00	9,65,615.36	6,94,270.00
1. Coconut Cess	6,37,487.57	11,17,369.99	9,00,000.00	9,00,000.00	9,00,000.00
2. Other receipts					
(a) Receipts from publications	7,769.91	9,413.78	33,000.00	33,000.00	55,500.00
(b) Miscellaneous receipts	7,767.25	52,525.72	200.00	1,000.00	200.00
(c) Receipts from:—					
(i) C. C. R. S., Kasaragod					
1. Farm produce, Rent of building etc.	60,270.73	70,842.35	65,700.00	70,000.00	65,740.00
2. Receipts from the Scheme for procurement and supply of seed coconuts to States	3,346.50	71,384.12	24,000.00	54,000.00	1,22,000.00
(ii) C. C. R. S., Kayangulam.					
1. Farm produce, rent of building etc.	20,218.73	24,217.89	20,500.00	33,500.00	25,000.00
2. Receipts from the Scheme for the control of leaf disease of coconut.	600.37	—	—	—	—
(iii) Receipts from I. C. A. R., for I. C. A. R. Schemes.	5,000.00	—	—	—	10,115.00
	9,89,698.47	17,51,863.37	19,30,865.00	20,87,115.36	18,70,826.00



## ANNEXURE II

### Indian Central Coconut Committee

Revised Budget Estimates for 1959-'60 and Budget Estimates for 1960-'61.

#### Payments (Part I)

Particulars	Actuals 1957-'58	Actuals 1958-'59	Sanctioned Budget 1959-'60	Revised Estimates 1959-'60	Budget Estimates 1960-'61
(1)	(2)	(3)	(4)	(5)	(6)
<b>I. Administration</b>	<b>Rs.</b>	<b>nP.</b>	<b>Rs.</b>	<b>nP.</b>	<b>Rs.</b>
A. (i) Office of Indian Central Coconut Committee	1,21,960.59	1,27,853.26	1,47,158.00	1,49,380.00	1,53,911.00
(ii) Buildings, Residential & Non-residential	—	75,000.00	2,25,000.00	2,25,000.00	2,06,000.00
B. T. A. of Non-Official members	8,956.84	9,363.33	10,000.00	10,000.00	10,000.00
C. Publicity & Propaganda	33,155.83	88,018.32	60,000.00	1,60,000.00	72,000.00
<b>II. Agricultural Research</b>					
A. Research Stations					
(i) C.C.R.S. Kasaragod					
(a) Non-recurring expenditure	22,346.31	21,951.25	32,800.00	38,500.00	69,250.00
(b) Recurring expenditure	1,52,158.70	1,91,460.00	2,36,610.00	3,50,350.00	4,36,120.00

(1)	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
(c) Scheme for Hormone Spraying (I. C. A. R.)	—	—	—	—	5,000.00	—	5,000.00	—	10,116.00	—
(ii) C.C.R.S. Kayangulam										
(a) Non-recurring expenditure	11,111.44	—	15,434.61	—	45,275.00	—	45,275.00	—	90,500.00	—
(b) Recurring expenditure	1,55,824.40	—	1,66,603.24	—	1,83,400.00	—	1,86,100.00	—	2,03,700.00	—
(c) Scheme for the control of leaf disease of coconuts	1,617.70	—	—	—	—	—	—	—	—	—
B. Grant-in-aid Schemes										
(a) Research Schemes										
R. C. R. S. in —										
1. Travancore (Kerala)	26,000.00	—	32,267.00	—	14,050.00	—	18,392.00	—	15,000.00	—
2. Andhra	4,550.00	—	5,400.00	—	6,819.00	—	6,819.00	—	12,158.00	—
3. Bombay	11,660.00	—	3,198.00	—	7,000.00	—	7,000.00	—	11,400.00	—
4. Orissa	—	—	—	—	—	—	—	—	—	—
5. Assam	—	—	9,000.00	—	—	—	14,244.00	—	9,090.00	—
(b) Coconut Nurseries										
1. Madras, Comprehensive (Pattukottai)	675.00	—	—	—	—	—	—	—	—	—
2. Irinjalakuda	—	—	—	—	—	—	—	—	—	—
3. Kumta, Mysore	—	—	—	—	—	—	—	—	—	—



(1)	(2)	(3)	(4)	(5)	(6)
	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.
4. Assam	—	—	—	—	—
5. Orissa, Comprehensive	1,950.00	2,000.00	1,900.00	15,102.00	15,326.00
6. Hebbal, Mysore	—	—	—	—	—
7. Nandgaon, Bombay	—	—	—	—	—
8. West Bengal (Chandernagore.)	4,240.00	4,275.00	3,700.00	5,303.00	5,597.00
9. Scheme for expansion of coconut nurseries in Kerala State	1,675.00	6,775.00	68,000.00	54,746.00	4,500.00
10. Andhra, Comprehensive	—	—	190.00	16,974.00	5,845.00
11. Ollukkara	1,155.00	685.00	—	1,515.00	1,233.00
12. Northern Part of West Bengal-Cooch Behar	2,120.00	2,690.00	—	2,430.00	1,654.00
13. Wadakkancherry	2,080.00	1,470.00	777.00	1,527.00	2,121.00
14. Coconut nurseries in N.E.S. Blocks, Kerala	—	6,245.00	15,570.00	1,730.00	30,800.00
15. Assam, 2 additional nurseries	—	—	—	—	—
16. Nilesghwar & Tikkoti	3,530.00	—	3,399.00	5,399.00	3,497.00
17. N.E.S. Nurseries, Assam	—	—	—	—	17,300.00
18. N.E.S. Nurseries, West Bengal	—	—	—	—	17,300.00

(1)	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
<i>C. Miscellaneous</i>										
1. Scheme for the establishment of zonal parasite breeding stations for biological control of <i>Nephantis serinopa</i>										
(i) Kerala	6,700.00		7,999.00		9,370.00		16,888.00		18,692.00	
(ii) Razole, Andhra State	—		—		—		5,058.00		—	
(iii) Tirunelveli, Madras State	—		—		—		—		—	
(iv) Puri, Orissa	—		—		—		2,134.00		3,162.00	88
2. Scheme for the development of coconut cultivation in Andamans.	—		—		—		—		—	
3. Scheme for the development of coconut cultivation in West Bengal	—		—		—		—		—	
4. Crop Competition for coconut in Kerala	—		—		—		—		—	
5. Scheme for maintenance of representative varieties of coconuts in Assam	—		510.00		410.00		410.00		563.00	



(1)	(2)	(3)	(4)	(5)	(6)
	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.
6. Scheme for the investigation of band disease of coconut palm in Bombay State	7,633.00	8,050.00	7,524.00	10,305.00	18,430.00
7. Coconut Fertiliser Demonstration Scheme	—	—	—	188.00	2,500.00
III. Marketing Schemes					
(i) Badagara Kiln	2,165.00	—	—	—	—
(ii) Spraying Schemes by Co-operative Unions	—	—	—	—	—
(iii) Organisation of Co-operative Marketing Societies in Andhra Pradesh	—	—	—	7,076.00	10,396.00
(iv) Payment of Government of India loan	24.14	—	—	—	—
Refund of Security deposit	300.00	—	—	—	—
	5,83,588.95	7,86,248.01	10,83,952.00	13,62,845.00	14,58,811.00
Closing Balance	4,06,109.52	9,65,615.36	8,46,913.00	6,94,270.00	4,12,015.00
	9,89,698.47	17,51,863.37	19,30,865.00	20,57,115.00	18,70,826.00

### I. A. Administration—Revised Budget Estimates for 1959-'60 and Budget Estimates for 1960-'61

Particulars	Actuals 1957-'58	Actuals 1958-'59	Sanctioned Budget Revised Estimates 1959-'60	Budget Estimates 1960-'61
...	...	...	...	...

	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
1. Pay of Officers and Staff.	52,961.84		51,191.45		61,314.00		57,371.00		60,968.00	
2. Leave Salary & Pension Contribution.	6,004.03		4,791.35		6,153.00		5,318.00		5,419.00	
3. I. C. Soc. C. Provident Fund Contribution.	5,000.00		5,893.06		6,650.00		7,000.00		9,700.00	
4. Allowances & Honoraria										
(a) Travelling Allowance.	7,271.89		7,498.56		9,000.00		9,000.00		9,000.00	
(b) Dearness Allowance.	23,755.98		24,742.45		28,781.00		27,017.00		28,327.00	
(c) House Rent Allowance.	2,047.84		2,104.33		2,450.00		2,324.00		2,427.00	
(d) Medical Attendance.	1,040.56		1,011.19		2,000.00		2,000.00		2,000.00	
5. Contingencies.										
(a) Rent & Accommodation.	3,083.72		3,065.53		4,000.00		4,000.00		4,000.00	
(b) Postage, telegrams & telephone.	5,673.17		7,578.22		5,500.00		8,000.00		8,000.00	
(c) Books & Publications.	744.27		576.47		500.00		750.00		750.00	
(d) Stationery & Forms.	3,663.84		5,171.99		4,000.00		6,000.00		6,000.00	
(e) Printing.	4,754.55		2,904.09		3,000.00		4,500.00		4,500.00	
(f) Office Contingencies.	3,833.77		6,100.72		4,000.00		7,000.00		7,000.00	
(g) Furniture & Office Equipment.	2,009.69		2,823.85		3,000.00		3,000.00		4,500.00	
(h) Audit Fee.	—		2,400.00		6,810.00		6,100.00		1,320.00	
	1,21,845.16		1,27,853.26		1,47,158.00		1,49,380.00		1,53,911.00	



## ANNEXURE IV

C.C.R.S., Kasaragod - Revised Budget Estimates for 1959-'60 & Budget Estimates for 1960-'61

### 2. (c) I. Receipts.

(Part I)

Particulars	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
Farm produce, rent of buildings etc.	60,270.73		70,842.75		65,700.00		70,000.00		65,740.00	
Receipts from the scheme for procurement and supply of seed coconuts	3,346.50		71,384.12		24,000.00		54,000.00		1,20,000.00	
	63,617.23		1,42,226.87		89,700.00		1,24,000.00		1,85,740.00	

### II. A (i) Expenditure

(a) *Non-recurring expenditure*

1. Cost of land
2. Layout
3. Buildings-residential & non-residential
4. Stores

(i) Farm implements including carts & van

1,676.12	—	—	—	—	—
103.37	905.34	11,500.00	11,500.00	11,500.00	11,500.00
14,503.57	—	10,000.00	10,000.00	10,000.00	10,000.00
145.62	434.12	2,500.00	3,000.00	1,000.00	1,000.00

(1)	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
(ii) Furniture & office equipment	664.71		16,254.11		2,500.00		2,500.00		12,000.00	
(iii) Laboratory equipments	5,184.42		4,357.68		5,000.00		10,000.00		32,500.00	
(iv) Meteorological observatory	68.50		—		500.00		500.00		500.00	
(v) Photographic equipments	—		—		800.00		1,000.00		750.00	
5. Live stock	—		—		—		—		1,000.00	
	22,346.31		21,951.25		32,800.00		38,500.00		69,250.00	
(b) <i>Recurring Expenditure</i>										
1. Pay of officers and staff	59,313.72		56,196.86		73,500.00		69,200.00		75,500.00	
2. <i>Allowances &amp; Honoraria</i>										
(i) Dearness allowance	26,415.94		25,637.58		32,610.00		30,600.00		33,100.00	
(ii) Other compensatory allowances including medical attendance	21.00		—		1,000.00		1,000.00		1,000.00	
(iii) Travelling allowance	4,669.00		4,200.69		5,000.00		5,000.00		5,000.00	
(iv) Honoraria	—		—		200.00		200.00		200.00	
3. Leave Salary & Pension contribution	1,688.37		1,517.35		2,500.00		1,500.00		2,000.00	
4. Provision for I.C.Coc.C. Provident Fund contribution	3,556.00		5,789.00		6,300.00		5,600.00		6,200.00	



(1)	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
5. Petty construction & repairs	9,432.92		10,512.89		7,500.00		10,000.00		8,750.00	
6. <i>Other Charges</i>										
(a) <i>Farm working expenses</i>										
1. Cultivation charges	7,574.96		9,704.91		13,900.00		15,000.00		15,500.00	
2. Manures & Chemicals	7,310.95		5,121.40		13,200.00		13,250.00		13,450.00	
3. Maintenance of cattle	3,805.15		4,524.41		5,000.00		5,000.00		5,350.00	
4. Miscellaneous expenses	17,257.78		20,489.03		20,000.00		27,000.00		30,000.00	
(b) Apparatus & Materials	3,091.53		10,168.14		8,000.00		13,000.00		18,500.00	
(c) Library Books & Periodicals	2,577.33		1,944.76		4,000.00		4,000.00		7,000.00	
(d) Office Contingencies	5,444.05		7,026.49		7,600.00		8,500.00		11,500.00	
7. Scheme for procurement and supply of seed coconuts to States	—		28,626.49		36,300.00		1,41,500.00		2,03,070.00	
	1,52,158.70		1,91,460.00		2,36,610.00		3,50,350.00		4,36,120.00	

# ANNEXURE V

C.C.R.S., Kayangulam - Revised Budget Estimates for 1959-'60 & Budget Estimates for 1960-'61

## 2. C. (ii) Receipts (Part I)

Particulars	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
Farm produce, rent on buildings etc.	20,218.73		24,217.89		20,500.00		33,500.00		25,000.00	
Receipts from the scheme for the control of leaf disease of coconuts	600.37		—		—		—		—	
	20,819.10		24,217.89		20,500.00		33,500.00		25,000.00	

## II. A (ii) Expenditure

### (a) Non-recurring expenditure

1. Cost of land
2. Layout
3. Buildings-residential & non-residential
4. Stores

### (i) Farm implements including carts & vans

	—		—		—		—		—	
	500.50		—		1,000.00		1,000.00		8,000.00	
	4.58		5,120.00		10,000.00		10,000.00		43,000.00	
	530.72		739.59		2,000.00		2,000.00		3,000.00	



(1)	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
(ii) Furniture & Office equipments	4,765.52		1,027.39		3,000.00		3,000.00		3,000.00	
(iii) Laboratory equipments	2,472.45		6,799.02		25,275.00		25,275.00		25,000.00	
(iv) Meteorological observatory	403.72		553.24		1,000.00		1,000.00		5,000.00	
(v) Photographic equipment	2,433.95		1,195.37		3,000.00		3,000.00		3,500.00	
	11,111.44		15,434.61		45,275.00		45,275.00		90,500.00	
(b) <i>Recurring Expenditure</i>										
1. Pay of Officers & Staff	67,386.78		65,905.12		76,250.00		72,500.00		78,600.00	
2. <i>Allowances &amp; Honoraria</i>										
(i) Dearness Allowance			25,436.33		30,150.00		28,000.00		30,100.00	
(ii) Other compensatory allowance including medical attendance	15.03		97.15		1,000.00		1,000.00		1,000.00	
(iii) Travelling Allowance	5,550.28		7,621.56		6,000.00		6,000.00		6,000.00	
(iv) Honoraria	—		—		500.00		500.00		500.00	
3. Leave salary & pension contribution	1,704.66		971.76		1,500.00		3,100.00		1,500.00	
4. Provision for I.C.Coc. C. Provident Fund Contribution	4,611.00		7,568.00		7,000.00		7,000.00		8,000.00	
5. Petty construction & repairs	5,663.68		6,862.87		8,000.00		9,000.00		10,000.00	

(1)	(2)	(3)	(4)	(5)	(6)
	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.
6. Other charges					
(a) Farm working expenses					
(i) Cultivation charges	6,499.49	7,919.29	9,000.00	9,000.00	10,000.00
(ii) Manures & chemicals	9,245.34	9,278.45	12,000.00	12,000.00	15,000.00
(iii) Maintenance of cattle	—	—	—	—	—
(iv) Miscellaneous expenses	14,776.48	13,881.42	16,000.00	18,000.00	18,000.00
(b) Apparatus & materials	4,999.53	4,975.26	5,000.00	5,000.00	10,000.00
(c) Library books & periodicals	2,828.72	2,603.41	3,000.00	3,000.00	5,000.00
(d) Office contingencies	5,780.23	13,482.62	8,000.00	12,000.00	10,000.00
	1,55,824.40	1,66,603.24	1,83,400.00	1,86,100.00	2,03,700.00
(c) Scheme for the control of leaf disease of coconuts	1,617.70	—	—	—	—



## ANNEXURE VI

I. C. Coc. C., Revised Budget Estimates for 1959-'60 and Budget Estimates for 1960-'61.  
(Part II)

### Second Five-Year Plan

#### Receipts

Particulars	Actuals 1957-'58		Actuals 1958-'59		Sanctioned Budget 1959-'60		Revised Estimates 1959-'60		Budget Estimates 1960-'61	
(1)	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
Opening balance	87,911.62		64,325.25		—		63,175.26		—	
Contribution from the Central Government towards cost of Research Schemes under the Second Five-Year Plan	2,79,165.94		3,85,674.75		8,00,000.00		8,43,620.74		11,84,074.00	
Amount transferred from Co- naut Improvement Fund Account	9.69		—		—		—		—	
	3,67,087.25		4,50,000.00		8,00,000.00		9,06,796.00		11,84,074.00	

## ANNEXURE VII

### I.C. Coc. C., Revised Budget Estimates for 1959-'60 and Budget Estimates for 1960-'61 (Part II) Expenditure

Particulars	Actuals 1957-'58	Actuals 1958-'59	Sanctioned Budget 1959-'60	Revised Estimates 1959-'60	Budget Estimates 1960-'61
(1)	(2)	(3)	(4)	(5)	(6)
I. Administration	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.
II. Agricultural Research	15,760.75	22,657.85	24,730.00	24,807.00	28,214.00
A. Research Stations					
(i) C.C.R.S., Kasaragod					
(a) Non-recurring expenditure	52,874.00	42,532.73	54,700.00	2,09,000.00	1,49,300.00
(b) Recurring expenditure	3,945.44	45,190.84	1,12,800.00	1,07,100.00	1,22,150.00
(ii) C.C.R.S., Kayangulam					
(a) Non-recurring expenditure	20,427.39	35,058.72	47,500.00	56,500.00	2,90,000.00
(b) Recurring expenditure	10,384.80	74,099.30	1,07,280.00	1,06,600.00	1,29,050.00
B. Grant-in-aid Schemes					
Regional Coconut Research Stations in:-					
1. Orissa	27,382.00	15,650.00	22,750.00	18,850.00	19,276.00



(1)	(2)	(3)	(4)	(5)	(6)
	Rs.	nP.	Rs.	nP.	Rs.
					nP.
2. Madras	—	3,510.00	3,672.00	7,370.00	3,840.00
3. Mysore	3,150.00	14,950.00	41,320.00	25,022.00	19,664.00
III. Marketing & Economics Surveys					
(i) Pilot Schemes for the correct estimation of area & yield of coconuts					
Grant-in-aid to States:—					
1. Kerala	—	18,150.00	26,100.00	34,000.00	37,050.00
2. Madras	—	4,500.00	16,477.00	15,400.00	13,500.00
3. Mysore	—	6,966.00	27,764.00	27,948.00	19,279.00
4. Andhra	—	—	16,969.00	24,998.00	24,250.00
5. Bombay	—	12,680.00	18,820.00	23,037.00	21,075.00
6. Orissa	—	—	16,250.00	11,625.00	15,734.00
7. West Bengal	—	—	8,000.00	—	19,822.00
8. Assam	—	17,566.00	30,208.00	28,752.00	27,291.00
(ii) Compilation & analysis of data	—	7,697.61	18,928.00	18,928.00	29,222.00
(iii) Enquiry into cost of cultivation of coconuts in Kerala	—	—	28,000.00	28,000.00	67,588.00

(1)	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
(iv) Scheme for the revision of the report on the marketing of coconuts in India	—	—	—	—	16,061.00	—	11,539.00	—	32,461.00	—
IV. (a) Scheme for control of coconut pests in:—										
1. Madras	—	—	13,930.00	—	12,611.00	—	12,060.00	—	12,228.00	—
2. Andhra	—	—	24,958.00	—	19,145.00	—	16,867.00	—	17,047.00	—
3. Bombay	—	—	5,925.00	—	21,831.00	—	25,263.00	—	16,632.00	—
4. Kozhikode	1,760.00	—	4,348.00	—	5,280.00	—	6,157.00	—	4,521.00	—
5. Udangudi in Madras State	—	—	—	—	—	—	2,825.00	—	5,650.00	—
(b) Scheme for the control of Anabe roga of coconut in Mysore	—	—	6,445.00	—	8,000.00	—	8,450.00	—	8,565.00	—
(c) Disease investigation scheme in Andhra Pradesh	—	—	—	—	59,135.00	—	30,310.00	—	25,107.00	—
V. Technological schemes										
(i) Scheme for solvent extraction of oil cake at Regional Research Laboratory, Hyderabad	—	—	10,000.00	—	10,433.00	—	5,592.00	—	2,796.00	—



(1)	(2)	(3)	(4)	(5)	(6)
Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.	Rs. nP.
(ii) Scheme for preparation of activated charcoal at Regional Research Laboratory, Hyderabad	—	—	5,241.00	4,926.00	2,462.00
(iii) Scheme for preparation of vinegar etc., at the Central Food Technological Research Institute, Mysore Adjustment made for amount transferred from No. I Account	—	—	19,995.00	14,870.00	20,300.00
Refund to Govt. of India Closing Balance	1,35,684.38 1,67,077.62 64,325.25	3,86,824.74 — 63,175.26	8,00,000.00 — —	9,06,796.00 — —	11,84,074.00 — —
	3,67,087.25	4,50,000.00	8,00,000.00	9,06,796.00	11,84,074.00

# ANNEXURE VIII

## I. Administration – Revised Budget Estimates for 1959-'60 & Budget Estimates for 1960-'61 (Part II)

Particulars	Actuals 1957-'58		Actuals 1958-'59		Sanctioned Budget 1959-'60		Revised Estimates 1959-'60		Budget Estimates 1960-'61	
(1)	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
1. Pay of Staff	7,875.40		10,772.16		11,830.00		11,432.00		12,184.00	
2. Dearness Allowance	6,396.97		8,734.40		9,110.00		8,825.00		9,100.00	
3. House rent allowance	821.38		1,087.39		1,140.00		1,100.00		1,130.00	
4. I. C. Coc. C. Pro- vident Fund contri- bution	667.00		1,827.00		1,650.00		2,350.00		3,600.00	
5. Travelling Allowance	—		236.90		1,000.00		1,000.00		1,000.00	
6. Medical Attendance	—		—		—		—		1,000.00	
7. Contingencies	—		—		—		100.00		200.00	
	15,760.75		22,657.85		24,730.00		24,807.00		28,214.00	



## ANNEXURE IX

### II. A (i) C.C.R.S., Kasaragod

#### Revised Budget Estimates for 1959-'60 & Budget Estimates for 1960-'61

#### (Part II)

Particulars	(1)		(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
(a) <i>Non-recurring expenditure</i>												
1. Cost of land	—		30,000.00				—		1,00,000.00		—	
2. Layout	—		474.00				7,500.00		7,500.00		7,500.00	
3. Buildings-residential & non-residential	45,910.00		10,220.00				—		78,000.00		1,00,000.00	
4. <i>Stores</i>												
(i) Farm implements including carts & vans	1,612.65		1,220.55				—		—		2,000.00	
(ii) Furniture & office equipments	3,227.25		—				1,000.00		2,000.00		4,000.00	
(iii) Laboratory equipments	2,124.10		618.18				46,200.00		21,500.00		35,300.00	
	52,874.00		42,532.73				54,700.00		2,09,000.00		1,49,300.00	

(1)	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
(b) <i>Recurring Expenditure</i>										
1. Pay of officers & staff	2,223.01		21,705.79		47,500.00		41,900.00		49,700.00	
2. <i>Allowances &amp; Honoraria</i>										
(i) Dearness Allowance	1,542.46		12,773.15		26,000.00		23,450.00		26,100.00	
(ii) Travelling Allowance	—		538.46		3,000.00		5,000.00		5,000.00	
(iii) Other compensatory allowance including medical attendance	—		—		1,000.00		1,000.00		1,000.00	
(iv) Honoraria	—		—		—		—		—	
3. Petty construction & repairs	—		1,098.00		1,000.00		1,000.00		1,000.00	
4. I. C. Coc. C. Provident Fund contribution	154.00		2,102.00		4,000.00		4,500.00		5,100.00	
5. <i>Other Charges</i>										
(a) Farm working expenses	—		—		5,000.00		5,000.00		5,000.00	
(b) Apparatus & materials	20.47		5,197.26		17,000.00		15,750.00		18,750.00	
(c) Library books & periodicals	—		703.82		5,000.00		2,500.00		2,500.00	
(d) Office contingencies	5.50		1,072.36		3,300.00		7,000.00		8,000.00	
	3,945.44		45,190.84		1,12,800.00		1,07,100.00		1,22,150.00	



# ANNEXURE X

II. a. ii. C. C. R. S., Kayangulam

Revised Budget Estimates for 1959-'60 & Budget Estimates for 1960-'61

(Part II)

Particulars	Actuals 1957-'58		Actuals 1958-'59		Sanctioned Budget Period Estimates 1959-'60		Budget Estimates 1960-'61	
(1)	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
(a) <i>Non-recurring expenditure</i>								
1. Cost of land	—	—	27,008.44	—	—	—	—	—
2. Layout	—	—	—	4,000.00	13,000.00	—	1,000.00	—
3. Buildings-residential & non-residential	15,073.00	—	3,662.00	10,500.00	10,500.00	—	50,000.00	—
4. Stores								
(i) Farm implements including carts & vans	—	—	—	5,000.00	5,000.00	—	1,02,000.00	—
(ii) Laboratory equipments	496.03	—	4,293.02	26,000.00	26,000.00	—	1,35,000.00	—
(iii) Photographic equipments	4,853.36	—	95.26	—	—	—	—	—
(iv) Furniture & office equipments	—	—	—	2,000.00	2,000.00	—	2,000.00	—
	20,427.39	—	35,058.72	47,500.00	56,500.00	—	2,90,000.00	—

(1)	(2)		(3)		(4)		(5)		(6)	
	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.	Rs.	nP.
(b) <i>Recurring Expenditure</i>										
1. Pay of officers and staff	2,847.67		29,479.96		35,600.00		35,000.00		37,000.00	
2. <i>Allowances &amp; Honoraria</i>										
(i) Dearness allowance	2,009.96		20,359.36		24,180.00		24,000.00		24,050.00	
(ii) Other compensatory allowance including medical attendance	—		—		1,000.00		1,000.00		1,000.00	1
(iii) Travelling allowance	—		2,549.43		3,000.00		3,000.00		3,000.00	107
3. Other charges	5,387.17		18,340.55		40,000.00		40,000.00		60,000.00	—
4. I. C. Coc. C. Provident Fund contribution	140.00		3,370.00		3,500.00		3,600.00		4,000.00	—
	10,384.80		74,099.30		1,07,280.00		1,06,600.00		1,29,050.00	



**APPENDIX III**  
**THE PROVIDENT FUND RULES**  
(Government of India)  
Department of Agriculture  
**NOTIFICATION**

New Delhi, dated the 30th, April, 1947.

No. F. 1-11/46-Crops - In exercise of the powers conferred by sub-section (3) of Section 8 of the Provident Funds Act, 1925 (XIX of 1925), the Central Government is pleased to add to the schedule to the said Act the name of the following public institution, namely:—

\* “The Indian Central Coconut Committee”.

No. F. 1-11/46-Crops - In exercise of the powers conferred by sub-section (2) of Section 8 of the Provident Funds Act, 1925 (XIX of 1925), the Central Government is pleased to direct that the provisions of the said Act shall apply to the Provident Fund established for the benefit of the employees of the Indian Central Coconut Committee.

No. F. 1-11/46-Crops - In exercise of the powers conferred by Section 18 of the Indian Coconut Committee Act, 1944 (X of 1944), the Central Government is pleased to make the following rules:—

**INDIAN CENTRAL COCONUT COMMITTEE**  
**PROVIDENT FUND RULES**

1. *Short title and definitions*
  - (1) These rules may be called the Indian Central Coconut Committee Provident Fund Rules.
  - (2) They shall come into force on the date of publication in the Gazette of India.
2. (1) In these rules, unless there is anything repugnant in the subject or context:—

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\* Amended by notification No. F. 1-11/46-Crops, dated 13/15th October, 1947 of the Ministry of Agriculture, Government of India.

- (i) "Committee" means the Indian Central Coconut Committee constituted under the Indian Coconut Committee Act, 1944;
- (ii) "Emoluments" means pay including dearness pay, leave salary or subsistence grant as defined in the Fundamental Rules.
- (iii) "Family" means :—
  - (a) In the case of a male subscriber, the wife or wives and children of a subscriber; and the widow or widows and children of a deceased son of the subscriber.

Provided that if a subscriber proves that his wife has been judicially separated from him or has ceased under the customary laws of the community to which she belongs, to be entitled to maintenance, she shall henceforth be deemed to be no longer a member of the subscriber's family in matters to which these rules relate, unless the subscriber subsequently indicates by express notification in writing to the Secretary that she shall continue to be so regarded;

- (b) In the case of a female subscriber, the husband and children of the subscriber, and the widow or widows and children of a deceased son of the subscriber;

Provided that if a subscriber, by notification in writing to the Secretary expresses her desire to exclude her husband from her family, the husband shall henceforth be deemed to be no longer a member of the subscriber's family in matters to which these rules relate, unless the subscriber subsequently cancels formally in writing her notification excluding him.

Note I:— "Children" means legitimate children.

Note II:— An adopted child shall be considered to be a child when the Secretary or, if any doubt arises in the mind of the Secretary, the Committee, is satisfied that under the personal law of the subscriber, adoption is



legally recognized as conferring the status of a natural child, but in this case only.

- (iv) "Fund" means the Indian Central Coconut Committee Provident Fund;
- (v) "Leave" means any variety of leave recognized by the \* (Committee);
- (vi) "Secretary" means the Secretary to the Committee;
- (vii) "Year" means financial year.

(2) Any other expression employed in these Rules which is defined either in the Provident Funds Act, 1925 (XIX of 1925), (p) ( ) or in the Indian Coconut Committee Act, 1944 (Act X of 1944), or in the Indian Central Coconut Committee Rules, 1945, is used in the sense therein defined.

(3) *Constitution and management of the Fund.* The Fund shall be vested in and administered by the Committee.

(4) The Fund shall consist of:-

- (1) Subscriptions and contributions which are to be carried to the Fund in accordance with these Rules;
- (2) such additions to the Fund as the Committee may at any time and from time to time decide to make; and
- (3) the income of the Fund from loans, deposits and investments.

5. (1) These rules shall apply to every salaried officer and servant of the Committee employed either temporarily or on a long term basis, not being a person who is a permanent servant of the Central Government or of a State Government whose services have been lent or transferred to the Committee.

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\* Substituted by notification No. F. 2-90 51-Com. II, dated 5th November, 1951 of the Ministry of Food & Agriculture (Agri.) Government of India.

(p) Omitted by notification No. F. 2-90-Com. II dated 5th November, 1951 of the Ministry of Food & Agriculture (Agri.) Government of India.

Provided that these rules shall not apply to any such servant between whom and the Committee an agreement subsists in respect of a Provident Fund, other than an agreement providing for the application to him of these rules, and in the case of an agreement so providing, shall apply subject to the terms of such agreement.

Provided further that these rules shall also apply to non-pensionable servants of a Government State or Body employed temporarily in a research scheme, financed by the Committee in whole or in part, to the extent as the Committee may decide.

(2) Every servant of the Committee, to whom these rules apply and whose salary exceeds Rs. 50.00 per month shall subscribe to the Fund and every servant of the Committee to whom these rules apply and whose salary does not exceed Rs. 50.00 per mensem shall have the option to subscribe to the Fund.

#### 6. *Nomination*

(1) A subscriber shall, as soon as may be after joining the Fund, send to the Secretary a nomination conferring on one or more persons the right to receive the amount that may stand to his credit in the Fund, in the event of his death before that amount has become payable, or having become payable, has not been paid;

Provided that if, at the time of making the nomination, the subscriber has a family, the nomination shall not be in favour of any person or persons other than the members of his family.

(2) If a subscriber nominates more than one person under sub-rule (1), he shall specify in the nomination the amount or share payable to each of the nominees in such manner as to cover the whole of the amount that may stand to his credit in the Fund at any time.

(3) Every nomination shall be in such one of the Forms set forth in the First Schedule as is appropriate in the circumstances.



(4) A subscriber may at any time cancel a nomination by sending a notice in writing to the Secretary;

Provided that the subscriber shall, along with such notice send a fresh nomination made in accordance with the provisions of this rule.

\* (5) A subscriber may provide in a nomination

(a) in respect of any specified nominee that in the event of his predeceasing the subscriber, the right conferred upon that nominee shall pass to such other person as may be specified in the nomination;

(p) Provided that such other person to whom the right conferred upon the nominee who predeceases the subscriber shall pass, shall, if the subscriber has other members of the family, be one of such other members.

(b) that the nomination shall become invalid in the event of the happening of a contingency specified therein, provided that if at the time of making the nomination the subscriber has no family, he shall provide in the nomination that it shall become invalid in the event of his subsequently acquiring a family.

(6) Immediately on the death of a nominee in respect of whom no special provision has been made in the nomination under clause (a) of sub-rule (5) or on the occurrence of any event by reasons of which the nomination becomes invalid in pursuance of clause (b) of sub-rule (5), or the proviso thereto, the subscriber shall send to the Secretary a notice in writing cancelling the nomination together with a fresh nomination made in accordance with the provisions of this rule."

(7) Every nomination made, and every notice of cancellation given by a subscriber shall, to the extent

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\* As amended by notification No. F. 48-59/47-Com. dated 28th December, 1948 of the Ministry of Agriculture, Government of India.

(p) This proviso was added by notification No. F. 2-90/51-Com. II dated 5th November, 1951 of the Ministry of Food and Agriculture (Agri.), Government of India.

that it is valid take effect, on the date on which it is received by the Secretary.

(7) *Subscriber's accounts*

An account shall be opened in the name of each subscriber in which shall be credited:—

- (i) the subscriber's subscriptions;
- (ii) contributions made under Rule 11 by the Committee to his account;
- (iii) interest, as provided by Rule 12 on subscriptions; and
- (iv) interest, as provided by Rule 12 on contributions.

(8) *Conditions and rates of subscriptions*

(1) Every subscriber shall subscribe monthly to the Fund when on duty.

(2) A person employed under the Committee either temporarily or on a long-term basis, may subscribe to the Fund with effect from the date of his appointment under the Committee but he will not be entitled to claim the Committee's share of contribution to the Fund from such date until after he has completed 3 years of service under the Committee.

(3) A subscriber may, at his option, not subscribe during leave.

(4) The subscriber shall intimate his election not to subscribe during leave in the following manner:—

- (a) If he is an officer who draws his own pay bills, by making no deduction on account of subscription in his first pay bill drawn after proceeding on leave.
- (b) If he is not an officer who draws his own pay bills, by a written communication to the Secretary before he proceeds on leave.

Failure to make due and timely intimation shall be deemed to constitute an election to subscribe.

The option of a subscriber intimated under this sub-rule shall be final.



9. (1) The amount of subscription shall be fixed by the subscriber himself, subject to the following conditions:-

- (a) It shall be expressed in whole rupees.
- (b) It may be any sum, so expressed, not less than  $8\frac{1}{3}\%$  of his emoluments.
- (2) For the purposes of sub-rule (1) the emoluments of a subscriber shall be:-
  - (a) in the case of a subscriber who was in the service of the Committee on the 31st March of the preceding year the emoluments to which he was entitled on the said date;

Provided as follows:-

- (i) if the subscriber was on leave on the said date and elected not to subscribe during such leave or was under suspension on the said date, his emoluments shall be the emoluments to which he was entitled on the first day after his return to duty;
- (ii) if the subscriber was on deputation out of India on the said date or was on leave on the said date and continues to be on leave and has elected to subscribe during such leave, his emoluments shall be the emoluments to which he would have been entitled had he been on duty in India;
- (iii) if the subscriber joined the Fund for the first time on a day subsequent to the said date, his emoluments shall be the emoluments to which he was entitled on such subsequent date.
- (b) In the case of a subscriber who was not in the Committee's service on the 31st March of the preceding year, the emoluments to which he was entitled on the first day of his service or, if he joined the Fund for the first time on a date subsequent to the first day of his service, the emoluments to which he was entitled on such subsequent date.

Provided that, if the emoluments of the subscriber are of a fluctuating nature, they shall be calculated in such manner as the Committee may direct.

(3) The subscriber shall intimate the fixation of the amount of his monthly subscription in each year in the following manner:—

- (a) if he was on duty on the 31st March of the preceding year, by the deduction which he makes or agrees to be made in this behalf from his pay bill for that month;
- (b) if he was on leave on the 31st March of the preceding year and elected not to subscribe during such leave; or was under suspension on the said date, by the deduction which he makes or agrees to be made in this behalf from his first pay bill after his return to duty;
- (c) if he was on leave on the 31st March of the preceding year and continues to be on leave and has elected to subscribe during such leave, by the deduction he makes or agrees to be made in this behalf from his pay bill for that month;
- (d) if he has entered the service of the Committee for the first time during the year or joins the Fund for the first time, by the deduction which he makes or agrees to be made in this behalf from his pay bill for the month during which he joins the Fund;
- (e) if his emoluments are of the nature referred to in the proviso to sub-rule (2) (b) in such manner as the Committee may direct.

(4) The amount of subscription so fixed shall remain unchanged throughout the year;

Provided that if a subscriber is on duty for a part of a month and on leave for the remainder of the month, and if he has elected not to subscribe during leave, the amount of the subscription payable shall be proportionate to the number of days spent on duty in the month.



(5) When a subscriber is transferred to Foreign Service or sent on deputation out of India, he shall remain subject to the rules of the Fund in the same manner as if he were not so transferred or sent on deputation.

10. *Realization of subscriptions.*

The Committee shall have power to deduct from the emoluments of any subscriber the subscriptions due from him and principal and interest on the advance, if any, made to him from the fund.

11. *Contribution by the Committee:*

- (1) The Committee shall with effect from the 31st March of each year, make a contribution to the account of each subscriber;

Provided that if a subscriber quits the service or dies during a year contribution shall be credited to his account for the period between the close of the preceding year and the date of the casualty.

- (2) The contribution shall be equal to 1/12th of the subscriber's emoluments drawn on duty. Should a subscriber elect to subscribe during leave, his leave salary shall for the purpose of this rule be deemed to be emoluments drawn on duty.

- (3) The amount of contribution payable under sub-rule (2) shall be rounded to nearest whole rupee (eight annas and more counting as the next higher rupee).

## INTEREST

12. (1) The Committee shall pay to the credit of the account of the subscriber interest at such rate as Government may from time to time prescribe for the payment of interest on subscriptions to the Contributory Provident Fund (India), on the amount at his credit in the Fund.

- (2) Interest shall be credited with effect from the 31st March of each year in the following manner:—

- (i) On the amount at the credit of a subscriber on the 31st March of the preceding year, less any sums withdrawn during the current year—interest for twelve months;
- (ii) on sums withdrawn during the current year—interest from the 1st April of the current year upto the last day of the month preceding the month of withdrawal.
- (iii) on all sums credited to the subscriber's account after the 31st March of the preceding year—interest from the date of deposit upto the 31st March of the current year;
- (iv) The total amount of interest shall be rounded to the nearest rupee (eight annas and more counting as the next higher rupee);

Provided that when the amount standing at the credit of a subscriber has become payable, interest shall thereupon be credited under this sub-rule in respect only of the period from the beginning of the current year or from the date of deposit, as the case may be upto the date on which the amount standing at the credit of the subscriber became payable.

(3) For the purposes of this rule the date of deposit shall, in the case of recoveries from emoluments, be deemed to be the first day of the month in which they are recovered.

(4) In addition to any amount to be paid under Rule 19 interest thereon shall be paid at the prescribed rate upto the end of the calendar month preceding the month of payment provided that the interest shall be paid for a maximum period of six months commencing from the month in which payment became due.

Provided that no interest shall be paid in respect of any further period after the date on which the Secretary has intimated to that person (or his agent) as the date on which he is prepared to make payment in cash, or if he pays by cheque, after the date on which the cheque in that person's favour is put in the post.



(a) 12. A. *The Lapse and Forfeiture Accounts:*

All amounts which in the opinion of the Committee have lapsed or shall be deemed to have been forfeited, shall be transferred to a separate account to be called "The Lapse and Forfeiture Account" and shall be used and applied by the Committee as a reserve fund to meet any loss or depreciation of or in the investments for the time being of the Fund. Any profit arising on any of the said investments shall be transferred to the Lapse and Forfeiture Account. If and when the Committee is of the opinion that the amount to the credit of the Lapse and Forfeiture Account is sufficient to meet any possible loss or depreciation of or in the said investments, the surplus, if any, may be divided among the subscribers in such proportion as the Committee may decide.

13. *Advances from the Fund:*

A temporary advance may be granted to a subscriber from the amount standing to his credit in the Fund at the discretion of the Committee, who may delegate their power in this respect to the President, Vice-President and the Secretary of the Committee, subject to the following conditions:—

(a) No advance shall be granted unless the sanctioning authority is satisfied that the applicant's pecuniary circumstances justify it; and that it will be expended on the following object or objects and not otherwise:—

- (i) to pay expenses incurred in connection with the prolonged illness of the applicant or any person actually dependent on him;
- (ii) to pay for the overseas passage for reasons of health or education of the applicant or any person actually dependent on him;
- (iii) to pay obligatory expenses on a scale appropriate to the applicant's status in connection with

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(a) Inserted by notification No. F. 2-90 51 Com. II, dated 5th November, 1951 of the Ministry of Food & Agriculture (Agri.) Government of India,

marriages, funerals or ceremonies which by his religion it is incumbent on him to perform.

- (iv) An advance may also be granted for such purposes and on such conditions as are prescribed by the Government of India from time to time under the Contributory Provident Fund Rules (India).

(b) An advance shall not, except for special reasons, exceed three months' pay and shall, in no case, exceed the amount of subscriptions and interest thereon standing to the credit of the subscriber in the Fund.

(c) An advance shall not, except for special reasons, be granted until at least twelve months elapse after the final repayment of all previous advances together with interest thereon, unless the amount already advanced does not exceed two-thirds of the amount admissible under clause (b).

- (d) The sanctioning authority shall record in writing the reason for granting the advance.

Provided that if the reason is of a confidential nature it may be communicated to the Secretary personally and/or confidentially.

13-A. Payments towards insurance policies and family pension fund from the Fund.

(1) Subject to the conditions contained in rules 16 to 22 of the Contributory Provident Fund Rules of the Government of India;

- (a) (i) subscriptions to a family pension fund approved in this behalf by the Committee,

OR

- (ii) payments towards an insurance policy may at the option of a subscriber, be substituted for the whole or part of the subscriptions to the Fund.

- (b) The amount of subscriptions with interest thereon standing to the credit of a subscriber in the Fund may be withdrawn to meet :—

- (i) payments towards an insurance policy;



(ii) purchase of a single payment insurance policy;

OR

(iii) payment of a single premium or subscriptions to a family pension fund approved in this behalf by the Committee:—

Provided that no amount shall be withdrawn (1) before the details of the proposed policy have been submitted to the Committee and have been accepted by them as suitable;

OR

(2) to meet any payment for purchase made or effected more than twelve months before the withdrawal;

OR

(3) in excess of the amount required to meet a premium or subscription actually due for payment within six months of the date of withdrawal;

Provided further that payments towards an educational endowment policy may not be substituted for subscriptions to the Fund and that no amounts may be withdrawn to meet any payment or purchase in respect of such a policy if that policy is due for payment in whole or part before the subscriber's age of normal superannuation;

(c) Any amount withdrawn under clause (b) shall be paid in whole rupees only rounded to the nearest rupee (eight annas counting as the next higher rupee).

(2) The Committee may delegate their power under sub-rule (1) to the President, the Vice-President or the Secretary of the Committee.

Note:— (The words "Fund", "Subscriber", "Accounts Officer" and "Government" or "President" wherever they occur in the Contributory Provident Fund Rules of the Government of India shall, for the purpose of this rule, mean "Fund" "Servant of the Committee" and the "Committee" respectively as defined in the Committee's Provident Fund Rules).

(Amended as per Government of India Notification No. 7-134/55-Com. I I. C. Coc. C. (Provident Fund / M.M.(1)/56 dated 25-10-1956).

14. (1) An advance shall be recovered from the subscriber in such number of equal monthly instalments as the sanctioning authority may direct; but such number shall not be less than twelve unless the subscriber so elects, or in any case more than twenty-four. A subscriber may, at his option make repayment in a smaller number of instalments than that prescribed. Each instalment shall be a number of whole rupees, the amount of the advance being raised or reduced, if necessary to admit of the fixation of such instalments.

(2) Recovery shall be made in the manner provided in Rule 10, and shall commence from the first occasion after the advance is made on which the subscriber draws emoluments, other than the leave salary, for a full month. Recovery shall not be made, except with the subscriber's consent, while he is on leave and may be postponed by the sanctioning authority during the recovery of an advance of pay granted to the subscriber.

(3) If more than one advance has been made to a subscriber, each advance shall be treated separately for the purpose of recovery.

(4) (a) After the principal of the advance has been fully repaid interest shall be paid thereon at the rate of one-fifth percent of the principal for each month or broken portion of a month during the period between the drawal and complete repayment of the principal.

(b) Interest shall ordinarily be recovered in one instalment in the month after complete repayment of the principal; but, if the period referred to in clause (a) exceeds twenty months, interest may, if the subscriber so desires, be recovered in two equal monthly instalments. The method of recovery shall be that provided in sub-rule (2). Payments shall be rounded to the nearest rupee in the manner provided in sub-rule (3) of Rule 11.



(5) If an advance has been granted to a subscriber and drawn by him and the advance is subsequently disallowed before repayment is completed, the whole or balance of the amount withdrawn, shall, with interest at the rate provided in Rule 12, forthwith be repaid by the subscriber to the Fund or in default, be ordered by the Secretary to be recovered, by deduction from the emoluments of the subscriber by instalments or otherwise as may be directed by the sanctioning authority.

(6) Recoveries made under this rule shall be credited, as they are made, to the subscriber's account in the Fund.

15. *Circumstances in which accumulations are payable:*

When a subscriber quits the service of the Committee the amount standing to his credit in the Fund shall, subject to any deduction under Rule 18, become payable to him;

Provided that a subscriber, who has been dismissed from the service and is subsequently reinstated in the service, shall, if required to do so by the Committee, repay any amount paid to him from the Fund in pursuance of this rule, with interest thereon at the rate provided in Rule 12 in the manner provided in the proviso to Rule 16. The amount so repaid shall be credited to his account in the Fund, the part which represents his subscriptions and interest thereon, and the part which represents the Committee's contribution with interest thereon, being accounted for in the manner provided in Rule 7.

16. When a subscriber:—

(a) has proceeded on leave preparatory to retirement,

OR

(b) while on leave, has been permitted to retire or declared by competent medical authority to be unfit for further service the amount of subscriptions and interest thereon standing to his credit in the Fund shall, upon application made by him in that behalf to the Secretary, become payable to the subscriber:

Provided that the subscriber, if he returns to duty, shall, if required to do so by the Committee, repay to the Fund, for credit to his account, the whole or part of any amount paid to him from the Fund in pursuance of this rule, with interest thereon at the rate provided in Rule 12 in cash or securities, or partly in cash and partly in securities, by instalments or otherwise, by recovery from his emoluments or otherwise, as the Committee may direct.

17. Subject to any deduction under Rule 18 on the death of a subscriber before the amount standing to his credit has become payable, or where the amount has become payable, before payment has been made;

(i) When the subscriber leaves a family:—

(a) if a nomination made by the subscriber in accordance with the provisions of Rule 6 in favour of a member or members of his family subsists, the amount standing to his credit in the Fund or the part thereof to which the nomination relates, shall become payable to his nominee or nominees in the proportion specified in the nomination;

(b) if no such nomination in favour of a member or members of the family of the subscriber subsists, or if such nomination relates only to a part of the amount standing to his credit in the Fund, the whole amount or the part thereof to which the nomination does not relate, as the case may be, shall, notwithstanding any nomination purporting to be in favour of any person or persons other than a member or members of his family become payable to the members of his family in equal shares:—

Provided that no share shall be payable to:—

- (1) sons who have attained legal majority;
- (2) sons of a deceased son who have attained legal majority;
- (3) married daughters whose husbands are alive;



- (4) married daughters of a deceased son whose husbands are alive;

if there is any member of the family other than those specified in clauses (1), (2), (3) and (4):

Provided also that the widow or widows and the child or children of a deceased son shall receive between them in equal parts only the share which that son would have received if he had survived the subscriber and had been exempted from the provision of clause (1) of the first proviso.

Note:— Any sum payable under these rules to a member of the family of a subscriber vests in such member under sub-section (2) of Section 3 of the Provident Funds Act, 1925.

- (ii) When the subscriber leaves no family, if a nomination made by him in accordance with the provisions of Rule 6, in favour of any person or persons subsists, the amount standing to his credit in the Fund or the part thereof to which the nomination relates, shall become payable to his nominee or nominees in the proportion specified in the nomination.

Note:— (1) When a nominee is a dependent of the subscriber as defined in clause (c) of Section 2 of the Provident Funds Act, 1925, the amount vests in such nominee under sub-section (2) of Section 3 of that Act.

Note:— (2) When the subscriber leaves no family and no nomination made by him in accordance with the provisions of Rule 6 subsists, or if such nomination relates only to part of the amount standing to his credit in the Fund, the relevant provisions of clause (b) and of sub-clause (ii) of clause (c) of sub-section (1) of Section 4 of the Provident Funds Act, 1925, are applicable to the whole amount or the part thereof to which the nomination does not relate.

18. *Deductions:-*

(p) (1) Subject to the condition that no deduction may be made which reduces the credit by more than the amount of any contribution by the Committee with interest thereon credited under Rules 11 and 12, before the amount standing to the credit of a subscriber in the Fund is paid out of the Fund, the Committee may direct the deduction therefrom (q) ( ) of:-

(a) any amount, if a subscriber has been dismissed from the service for grave misconduct:

Provided that, if the order of dismissal is subsequently cancelled, the amount so deducted shall, on his reinstatement in the service, be replaced at his credit in the Fund;

(b) any amount if a subscriber resigns his employment under the Committee within three years of the commencement thereof, otherwise than by reason of superannuation or a declaration by competent medical authority that he is unfit for further service;

Provided that the Committee shall not direct any deduction under clause (b) when the subscriber resigns his employment with the permission of the Committee to take up service under any one of the following authorities namely:—

(i) A University or Institute which provides for pensionary status or provident fund to its employees, and

(p) Added by notification No. F. 2-90 51 Com. II dated 5th November, 1951 of the Ministry of Food & Agriculture (Agri.), Government of India.

(q) Omitted by notification No. F. 2-90, 51-Com. II dated 5th November, 1951 of the Ministry of Food & Agriculture (Agri.), Government of India.



- (ii) such other Committees or Bodies of similar status as the Committee may decide from time to time.
- (iii) The Central or State Government.
- (c) any amount due under a liability incurred by the subscriber to the Committee.
- (s) (2) Any amount deducted under clauses (a) and (b) of sub-rule (i) shall be transferred to the "Lapse and Forfeiture Account" and any amount deducted under clause (c) of that sub-rule shall be paid to the Committee or credited to the Fund, as the case may be.

19. *Payment*:-

- (1) When the amount standing to the credit of a subscriber in the Fund, or the balance thereof after any deduction under Rule 18, becomes payable, it shall be the duty of the Secretary, after satisfying himself, when no such deduction has been directed under that rule, that no deduction is to be made, to make payment as provided in Section 4 of the Provident Funds Act, 1925.
- (2) If the person to whom, under these rules any amount is to be paid is a lunatic for whose estate a manager has been appointed in this behalf under the Indian Lunacy Act, 1912, the payment will be made to such a manager, and not to the lunatic.
- (3) Any person who desires to claim payment under this rule shall send a written application in that behalf to the Secretary.

Note:- When the amount standing to the credit of a subscriber has become payable under Rules 15, 16 and 17, the Secretary shall authorise prompt payment of that portion of the amount standing to the credit of a subscriber in regard to

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- (s) Inserted by notification No. F. 2-90 51 Com. II, dated 5th November, 1951 of the Ministry of Food & Agriculture (Agri.) Government of India.

which there is no dispute or doubt, the balance being adjusted as soon after as may be.

20. *Procedure:-*

- (1) All sums paid into and from the Fund under these rules shall be accounted for in the books of the Committee to an account named "The Indian Central Coconut Committee Provident Fund Account".
- (2) Such accounts shall be examined and audited annually by the auditors appointed under sub-rule (2) of Rule 22 of the Indian Central Coconut Committee Rules, 1945.
- (3) Any loss to the Fund from any cause whatsoever shall be borne by and be a charge on the Fund and shall be deducted in the first instance from the income derived from subscribers' subscriptions before such income is distributed.
- (4) The custody and disbursement of the funds shall be regulated by rule 23 of the Indian Central Coconut Committee Rules, 1945 exactly in the same manner as the funds of the Committee.

21. (1) As soon as possible after the 31st March of each year, the Secretary shall send to each subscriber his pass book or a statement of his account in the Fund, showing the opening balance as on the 1st April of the year, the total amount credited or debited during the year, the total amount of interest credited as on the 31st March of the year and the closing balance on that date. The Secretary shall attach to the pass book or the statement of account an enquiry whether the subscriber:-

- (a) desires to make any alteration in any nomination made under Rule 6;
- (b) has acquired a family (in case where the subscriber has made no nomination in favour of a member of his family under the proviso to sub-rule (1) of Rule 6).



- (2) Subscribers should satisfy themselves as to the correctness of the pass book or the annual statement, and errors should be brought to the notice of the Secretary within one month from the date of receipt of the pass book or the statement.
22. Every subscriber shall sign an agreement set forth in the third schedule annexed to these rules agreeing to abide and be bound by these rules.
23. (1) The Fund may be wound up:-
- (a) if the Committee be dissolved by notification under Section 17 of the Indian Coconut Committee Act, 1944.
- OR
- (b) by resolution of the Committee approved by the Central Government.
- (2) On the winding up of the Fund the assets shall be realised and distributed amongst subscribers in accordance with their accounts. (The amount, if any, standing to the credit of the "Lapse and Forfeiture Account" constituted under Rule 12-A shall also be divided amongst the subscribers in such proportion as the Committee may decide.)
24. No amendments to those Rules shall be made without the previous sanction of the Central Government.

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\* Added by notification No. F. 2-90.51-Com. II, dated 5th November, 1951 of the Ministry of Food & Agriculture (Agri.) Government of India.

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\* FIRST SCHEDULE

See Rule 6 (3)

FORM OF NOMINATION

I. *When the Subscriber has a family and wishes to nominate one member thereof.*

I hereby nominate the person mentioned below, who is a member of my family as defined in Rule 2 of the Indian Central Coconut Committee Provident Fund Rules, to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable, or having become payable has not been paid:—

Name and address of nominee	Relationship with subscriber	Age	Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person, if any, to whom the right of the nominee shall pass in the event of his predeceasing the subscriber

Dated this.....day of.....19.....at.....

Signature of subscriber.....

Two witnesses to signature:

(1) Name..... (2) Name.....

Occupation..... Occupation.....

Address..... Address.....

Signature..... Signature.....

\* As amended by notification No. F. 8-59 47-Com. dated 28th December, 1948 of the Ministry of Agriculture, Government of India.



II. *When the Subscriber has a family and wishes to nominate more than one member thereof.*

I hereby nominate the persons mentioned below, who are members of my family as defined in Rule 2 of the Indian Central Coconut Committee Provident Fund Rules, to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable or having become payable, has not been paid and direct that the said amount shall be distributed among the said persons in the manner shown below against their names:

Name and address of nominee	Relationship with subscriber	Age	*Amount or share of accumulations to be paid to each	Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person, if any, to whom the right of the nominee shall pass in the event of his predeceasing the subscriber

Dated this.....day of.....19.....at.....

Signature of subscriber.....

Two witnesses to signature:

(1) Name..... (2) Name.....

Occupation..... Occupation.....

Address..... Address.....

Signature..... Signature.....

\* This column should be filled in so as to cover the whole amount that may stand to the credit of the subscriber in the Fund at any time.

III. *When the subscriber has no family and wishes to nominate one person.*

I, having no family as defined in Rule 2 of the Indian Central Coconut Committee Provident Fund Rules, hereby nominate the persons mentioned below to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable, or having become payable, has not been paid:—

Name and address of nominee	Relationship with subscriber	Age	**Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person, if any, to whom the right of the nominee shall pass in the event of his predeceasing the subscriber

Dated this.....day of.....19.....at.....

Signature of Subscriber.....

Two witnesses to signature:

(1) Name..... (2) Name.....

Occupation..... Occupation.....

Address..... Address.....

Signature..... Signature.....

\*\* Note:— Where a subscriber who has no family makes a nomination, he shall specify in this column that the nomination shall become invalid in the event of his subsequently acquiring a family.



IV. *When the subscriber has no family and wishes to nominate more than one person.*

I, having no family as defined in Rule 2 of the Indian Central Coconut Committee Provident Fund Rules, hereby nominate the persons mentioned below to receive the amount that may stand to my credit in the Fund, in the event of my death before that amount has become payable, or having become payable, has not been paid, and direct that the said amount shall be distributed among the said persons in the manner shown below against their names:—

Name and address of nominee	Relationship with subscriber	Age	*Amount or share of accumulation to be paid to each	**Contingencies on the happening of which the nomination shall become invalid	Name, address and relationship of the person, if any, to whom the right of the nominee shall pass in the event of his predeceasing the subscriber

Dated this.....day of.....19.....at.....

Signature of subscriber.....

Two witnesses to signature:

(1) Name..... (2) Name.....

Occupation..... Occupation.....

Address..... Address.....

Signature..... Signature.....

\* Note:— This column should be filled in so as to cover the whole amount that may stand to the credit of the subscriber in the Fund at any time.

\*\* Note:— Where a subscriber who has no family makes a nomination, he shall specify in this column that the nomination shall become invalid in the event of his subsequently acquiring a family.

## SECOND SCHEDULE

(See Rule 22)

### FORM OF AGREEMENT

I hereby declare that I have read the Indian Central Coconut Committee Provident Fund Rules and that I agree to abide and be bound by them.

Dated this.....day of.....19.....at.....

Name in full.....

Date of birth.....

Date of joining appointment.....

Nature of appointment.....

Salary per mensem.....Rupees

Signature.....

Witnesses:

(1) Name.....

Occupation.....

Address.....

Signature.....

(2) Name.....

Occupation.....

Address .....

Signature .....



## APPENDIX II

### Secretary's Note

*Subject No. 7.* Proceedings of the meeting of the Secretaries of the Commodity Committees held on the 18th July, 1959.

Enclosed is a copy of the proceedings of the meeting of the Secretaries of the Commodity Committees held on the 18th July, 1959.

The following subjects arising out of the decisions taken at the above meeting have been placed before the appropriate Sub-Committees of this Committee for their consideration:—

1. The policy question of starting permanent Research Sub-Stations.
2. Recruitment Rules.
3. Continuance of Statistical Schemes and
4. Delegation of powers to Secretary (Vide Subjects Nos. 13, 33, 70 & 80)

This is for the Committee's information.

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### Proceedings of the meeting with the Secretaries of the Commodity Committees held on 18th July, 1959.

*Present.*

1. Dr. M. S. Randhawa, Vice-President, Indian Council of Agricultural Research — Chairman.
2. Shri A. C. Bose, Joint Secretary, Ministry of Finance.
3. Dr. B. N. Uppal, Agricultural Commissioner, I. C. A. R.
4. Shri Prakash Krishen, I. A. S., Additional Secretary, I. C. A. R.
5. Dr. S. M. Sikka, Additional Agricultural Commissioner.

6. Dr. B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi.
7. Dr. Pushkar Nath, Director, Potato Research Institute, Simla.
8. Dr. B. L. Sethi, Secretary, Indian Central Cotton Committee, Bombay.
9. Dr. R. Sankaran, Secretary, Indian Central Oil-seeds Committee, Hyderabad.
10. Shri K. N. Agha, Secretary, Indian Central Jute Committee, Calcutta.
11. Dr. B. C. Kundu, Director, Jute Agricultural Research Institute, Calcutta.
12. Shri B. S. Varadarajan, Secretary, Indian Central Arecanut Committee, Kozhikode.
13. Dr. P. J. Gregory, Secretary, Indian Central Coconut Committee, Ernakulam.
14. Shri Pritam Singh, Secretary, Indian Lac Cess Committee, Ranchi.
15. Dr. G. R. Seth, Deputy Statistical Adviser, Indian Council of Agricultural Research.
16. Dr. P. K. Mukerji, Deputy Economic & Statistical Adviser.
17. Shri Raghubir Singh, I. A. S., Under Secretary, Department of Agriculture.
18. Shri Ajudhia Prasada, Under Secretary, Indian Council of Agricultural Research.

*Subject No. 1.* Organizational and administrative pattern of the various Commodity Committees and the direction in which improvements should be made in some of the Commodity Committees.

(i) The Chairman emphasized the need for an efficient organization for Economics and Statistics in the various Commodity Committees, and said that the Indian Central Jute Committee was having a suitable organization which could be adopted, with advantage, by the other Commodity Committees also, according to



their requirements. Dr. Seth remarked that from the experience he had about the working of the economics and statistics sections in the Committees, he would say that wherever these two subjects were being dealt with in one section, the statistics side of it was being neglected. He, therefore, felt that there should be a separate section for Statistics in the Committee. Since the organization as well as the need of the various Committees was different, Dr. Seth suggested that a small Sub-Committee be constituted to assess the requirements of each Committee and make suitable suggestions for strengthening the arrangements for economics and statistics. After some discussion, it was decided that a Sub-Committee, consisting of the following, may be constituted for the purpose:—

- 1) Dr. G. R. Seth, Deputy S. A. ... Chairman.
- 2) A representative of the Directorate of E. & S. ... Member.
- 3-9) Secretaries, Commodity Committees. ... Members.

In this connection, Dr. Sethi suggested that it would be helpful if the Chairman of the Sub-Committee first collects from the Commodity Committees data pertaining to the existing arrangements for economics and statistics in their organisations, the existing staff, the work being done, and also invite their suggestions as to the direction in which improvement was required, to enable the Sub-Committee to consider the matter and then take concrete decisions.

(ii) Shri Prakash Krishen observed that, at present, the Commodity Committees have a number of small sections, which does not appear to be proper from the administrative point of view. There is also no clear-cut demarcation of functions as between the various sections of the Committees. He, therefore, suggested that the Committees should look into the matter and re-organize the work into various sections on a more rational basis. The Chairman directed that the Commodity Committees should adopt the administrative pattern as suggested in

paragraph 4 of the Secretariat note circulated on the subject in so far as considered feasible, by re-arranging the existing staff. The Chairman emphasized that the occasion should not be used to increase the strength of the staff of Commodity Committees and re-organization should be done with the available staff.

*Subject No. 2.*      Proposal for the creation of a Planning Section in the Commodity Committees.

The Chairman observed that at present the Commodity Committees do not have full-fledged Planning Sections under them. These are the days of perspective planning and as such each Committee should be adequately equipped to deal with this important subject, either by strengthening the existing Statistics and Economics Section or where such a section does not exist, by creating a new one. Dr. Seth suggested that the question, whether the Committee should have a separate Planning Section or planning should be one of the subjects to be dealt in the Statistics and Economics Section of the Committees be referred for consideration to the Sub-Committee constituted under Subject No. 1. Dr. P. K. Mukerji felt that in view of the importance of the subject, there should be a separate Planning Section in the Commodity Committees. The Chairman, in conclusion, directed that in case of the Commodity Committees where the creation of full-fledged Planning Section was not considered essential or otherwise justified by the work load, 'Planning' may be handled as one of the subjects in the Economics and Statistics Section of the Committee, but due importance should be given to the subject.

*Subject No. 3.*      Review of the organizational pattern of the Sub-Committees constituted by the Commodity Committees.

(i) The organizational pattern of the Sub-Committees set up by the different Commodity Committees was reviewed. It was felt that there was no scope for reduction in the number of Sub-Committees under the various Committees. The Secretary, Indian Central



Coconut Committee, however, suggested that the Extension Sub-Committee of that Committee might be merged in the Development Wing of the Agricultural Research Sub-Committee of the Committee. This was agreed to.

(ii) Regarding the suggestion that some of the Commodity Committees may like to set up Local Sub-Committees on the analogy of the Indian Central Cotton Committee and the Indian Central Jute Committee, the Chairman observed that the position being peculiar to the above two Committees, there was no case for the Constitution of Local Sub-Committees in the other Committees.

*Subject No. 4. Procedure for conducting Annual Meetings.*

The procedure followed by the Indian Central Cotton Committee was generally approved for adoption by the other Committees. The Chairman, however, made the following further suggestions for adoption by the Committees:-

- (a) The Committee should plan their programme of meetings etc., for the entire year, print the same and circulate it to all concerned, well in advance.
- (b) There should be no meetings in the afternoons, during the annual and half yearly meetings of the Committees and;
- (c) there should be a gap of one day between the meetings of the Sub-Committees and the Main Committee to enable the Secretariat of the Committee to prepare papers for the meeting of the full Committee.

*Subject No. 5. Pattern of financial assistance in respect of improved seed schemes being financed by the Commodity Committees.*

- (i) The existing pattern followed by the various Committees was reviewed and noted.

(ii) The Chairman directed that a Sub-Committee consisting of the following officers be constituted to suggest suitable patterns of financial assistance in respect of:-

- (a) Improved Jute Seed Production Scheme and
- (b) Jute Research Schemes, to be financed by the Indian Central Jute Committee:-
  - (i) Dr. S. M. Sikka, Additional Agricultural Commissioner. (Chairman)
  - (ii) Financial Adviser to the Ministry of Food and Agriculture or his representative.
  - (iii) Dr. B. L. Sethi, Secretary, Indian Central Cotton Committee.
  - (iv)-(vii) Directors of Agriculture, Bihar, West Bengal, Assam and Orissa.
  - (viii) Chief Jute Development Officer.
  - (ix) Secretary, Indian Central Jute Committee (Convener).

The Sub-Committee which shall submit its report within three months of its constitution, will also consider whether the Jute Research and Seed Production Schemes should form part of the Third Five-Year Plan or else it should be financed by the Jute Committee as part of its normal activities.

(iii) Dr. Sethi explained the objects and salient features of the Model Scheme, integrating the Cotton Extension Schemes and the Cotton Seed Multiplication and Distribution Schemes, recently approved by the Indian Central Cotton Committee. The important point brought out was that funds for the Scheme were recommended to be channelled to the State Governments through the Committee and *not* directly by the Government of India to the States as is being done at present in the case of Cotton Extension Scheme.

*Subject No. 6.* Pattern of financial assistance in respect of the Research Schemes to be



financed by the Commodity Committees.

Dr. Sethi explained the existing pattern of financial assistance in respect of Research Schemes on cotton, both upto staple length of 1.1/8" and above, and suggested that all the research schemes on cotton should be financed in full for a period of 15 years.

Dr. Sikka stated that research is a long drawn-out process. When a particular scheme is sanctioned for a specified period, some new problems crop up in the meantime, necessitating in many cases further extension being given to the scheme. His view, therefore, was that there should be some sort of permanency in these schemes. He, therefore, suggested that instead of the Commodity Committees sanctioning the Research Schemes for specified periods, Research Sub-Stations should be opened on a permanent basis at the State level, where work on a number of schemes might be undertaken. This would not only give a sense of security to the staff working under the Scheme but also ensure continuity of the research work being done. Dr. Pal supported the suggestion made by Dr. Sikka. The Chairman added that even when the proposed Sub-Stations were to be set up, the Commodity Committees could insist upon a periodical review of the research work done, as at present.

(i) It was finally decided that the matter should be examined separately by each Committee and decisions taken at their annual meetings.

(ii) With regard to the suggestion contained in para (5) of the Secretariat Note on the subject, it was decided that the matter should be examined by each Commodity Committee separately and suitable decisions taken.

(iii) Since Arecanut and Coconut have almost identical problems to tackle in matters of research and development, it was agreed that both the Commodity Committees should follow the same pattern of financial assistance. The suggestion made in para (6) of the

Secretariat Note on the above subject to the effect that the Arecanut Committee should also meet only 33-1/3 per cent of the expenditure, during the extension period of the research schemes, was agreed to.

*Subject No. 7.* Pattern of financial assistance in respect of Statistical, Marketing and other schemes being financed by the Commodity Committees.

(i) The suggestion made by Dr. Sethi as embodied in para 2 (i) of the Secretariat Note on the above subject was approved.

(ii) The suggestion made by Dr. Sethi that the Government of India should grant interest-free loans under the development schemes on extra long staple cotton contained in para 2 (ii) of the Secretariat Note, was not agreed to.

*Subject No. 8.* Framing of Recruitment Rules for the Committee's employees.

The position stated in the Secretariat Note was noted. The Chairman directed that recruitment rules, on the lines of the Model Rules already circulated, should be framed by all the Commodity Committees expeditiously. The Chairman agreed to the suggestion made by Dr. G. R. Seth that the filling of the Statistician posts should not be by promotion of Statistical Assistants. These posts may be declared as selection posts for the purpose of recruitment. On the other hand, the Statistical Assistants during their service may be given opportunities to improve their statistical qualifications to make them fit for consideration for the posts of Statisticians. He also directed that suitable qualifications should also be adopted for the various posts. Framing of recruitment rules with proper qualifications, he added, would serve a two-fold purpose, i. e., while on the one hand it will give a sense of security to the Committee's staff, on the other it would ensure efficient and loyal service to the Commodity Committees.



Secretary, Indian Lac Cess Committee, suggested that the Committee's employees should be allowed the same pay-scales as are given to the persons in attached offices of the Central Government. Shri Ajudhia Prasad pointed out that the question was decided in 1948 in consultation with the Ministry of Finance, keeping in view the recommendations made by the First Pay Commission. He added that the pay scales being enjoyed by the employees of the Commodity Committees were in no way inferior to the pay-scales of the State employees. It was, therefore, agreed that the question need not be re-opened.

*Subject No. 9.* Proposal to grant gratuity to Committees' employees on retirement, death etc.

The position stated in the Secretariat Note on the subject was noted. It was decided that the matter be dropped for the present and may be re-opened if necessary, in the context of the recommendations made by the Second Pay Commission.

*Subject No. 10.* Proposal to link the Research Institutes of the Commodity Committees etc., with the Indian Agricultural Research Institute at the technical level in the matter of research work.

Shri Raghubir Singh explained the proposal. Both the Chairman and Dr. Uppal felt that it would not be desirable to link the Commodity Institutes with the Indian Agricultural Research Institute in the manner suggested. Dr. Pal elucidated that the main object behind the proposal was to associate the Heads of the various Divisions of the Indian Agricultural Research Institute with the technical programme of the Committee's Institutes, with a view to avoid duplication of effort and work and also to make the resources (in technical knowledge and material) at Indian Agricultural Research Institute available to the Commodity Committees, in framing the programme of work etc. It was finally decided that the respective Heads of Divisions of the

Indian Agricultural Research Institute should be associated in the drawing of the annual programme of work of the Commodity Committees, at the proper time.

*Subject No. 11.* Recommendations Nos. 7, 23 and 7, 24 made by the Agricultural Administration Committee.

(i) *Recommendation No. 7, 23.*

Some of the Secretaries of the Commodity Committees stated that the Committees, even now were competent to purchase stores direct without going through the Directorate General of Supplies and Disposals, irrespective of whether the value of the stores in question was below or above Rs. 5,000. It was agreed that in cases, where this was not the case, the position might be examined and the matter referred for consideration to the Committees and thereafter the Government of India, wherever necessary. The Chairman said that such of his time was being taken up in attending to routine matters referred to him in his capacity as the President by the various Commodity Committees. He directed that Under Secretary (Commodities) should examine the existing Schedules of Powers delegated to the Secretaries and President of the various Commodity Committees and draw up a tentative list of items where enhanced powers should be delegated to the Secretaries of the Committees, to enable them to put up suitable proposals before their respective Committees. The idea was that subject to the requirements of adequate check in administrative and financial matters of the Committee, the powers of the Secretaries be enhanced, so as to save the time of the President over such routine matters.

(ii) *Recommendation No. 7, 24.*

This was agreed to.

The Chairman, however, directed that the Committees should frame definite rules for the use, maintenance and repairs of transport vehicles owned by the Commodity Committees, wherever this has not been done already.





### APPENDIX III

#### Secretary's Note

*Subject No. 9.* Progress Report on the Central Coconut Research Station, Kayangulam for the year ended 30-6-1959.

A copy of the progress report on the Central Coconut Research Station, Kayangulam for the year 1958-59 received from the Director of the Station is attached to this note. As usual, a summary of the report has been forwarded to the Indian Council of Agricultural Research for scrutiny by the Scientific Committees of the Council. Their comments are awaited.

During the year under report a total number of 85,701 nuts were harvested as against 74,125 nuts obtained during the previous year. The price fetched for the coconuts ranged from Rs. 187 to Rs. 266 per thousand nuts.

A total number of 1601 seednuts collected from the Station were sown in the nursery and 584 seedlings sold to the local cultivators during the year under report.

In the last report on the progress of work of the Station, it had been mentioned that breeding of the wasp, *Scolia oryctophaga* was in progress and that no adults had emerged from the pupae, even after 9 months. It is now reported that during the year 9 adults (3 males and 6 females) emerged but were short-lived, their longevity under laboratory conditions being on an average 3 days, the maximum being 9 days.

Contruction of the Meteorological Tower for high altitude observations was completed on 15-4-1959 and that of the Insectory and Pot Culture House on 17-7-1959.

*Remarks of the Committee on the previous year's report and action taken thereon.*

The Committee had adopted the report for the year ending 30-6-1958 as a record of satisfactory work subject to the remarks (i) that the results showing the benefit of a combined programme of manuring and spraying in minimising the effect of coconut diseases should be brought to the notice of the coconut growers immediately and (ii) that the figures reported in Table 2 regarding the effect of Malathion in different concentrations on *Oryctes rhinoceros* larvae should be checked up. The Director, Central Coconut Research Station, Kayangulam was requested to prepare an article on the effect of combined manuring and spraying of coconut palms in minimising the effects of diseases for publication in the Committee's monthly "Bulletin" and to check up the figures given in Table 2 referred to above. He has replied saying that the article under reference is proposed to be presented as a paper at the Coconut Research Workers' Conference convened by the Committee and that it will be made available for publication in the Bulletin thereafter. Regarding the figures given in the table he has stated as follows:—

The figures given in Table 2 of the report under reference have been checked.

From this table it is seen that the increase in the percentage of mortality of grubs is not directly proportional to the increase in the concentration of insecticides in the breeding material. This anomaly may be explained as follows:—

When the feeding material is mixed up with greater quantity of insecticides, it is possible that either due to greater contact action (which produces a quick paralyzing effect on the grubs) or due to the deterrant effect of increased quantity of insecticide in the feeding material, at higher concentration, the grubs may not consume as much as they do at lower concentrations. Thus at concentration higher than the optimum, the contact action of the insecticide alone comes into play whereas



at lower concentrations the insecticide acts both as a contact as well as a stomach poison.

The Committee had also decided that the progress reports on the Station should be printed and copies supplied to the members of the Committee and coconut research workers in the Regional Coconut Research Stations. This is being done. The report for the year 1957-58 has already been printed and copies supplied to the members of the Committee and others.

The report may first be considered by the Agricultural Research and Development Sub-Committee (Research wing).

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# CENTRAL COCONUT RESEARCH STATION, KAYANGULAM.

## *Introduction*

The Central Coconut Research Station at Kayangulam deals with the investigations on the pests and diseases of the coconut palm. The Station consists of four research sections, namely, Entomology, Plant Pathology including Virus, Plant Physiology and Soil Chemistry. In addition to the 56.8 acres of the existing farm 3.25 acres of coconut garden were acquired under the Second Five-Year Plan Scheme.

## *Season and rainfall*

### 1. *Meteorological observations*

In order to study the effect of weather factors on the incidence of pests and diseases on the coconut crop a record of the weather factors is being kept at this Station with the help of meteorological instruments installed at the observatory. The data are summarised in Tables I, II, and III. The salient features are summarised below:-

#### (i) *Rainfall*

The rainfall statement for 1958-59 is given in Table I. A total of 1491.0 mm. of rain distributed over 65 days was received during the S. W. monsoon against a past three-year average of 1419.4 mm. in 76 days.

The N. E. monsoon was more poorly distributed than in previous years. 321.0 mm. of rain distributed over 30 days were received during this period. The average for the past three years on this account is 605.8 mm. on 32 days.

During the hot weather 679.4 mm. of rain were received on 35 days as against a three-year average of 422.2 mm. on 26 days. The total rainfall for the year was 2491.4 mm. on 130 rainy days.



Meteorological observations continued to be recorded twice daily during the year. Monthly averages of some of this data are given in Tables II and III.

(ii) *Temperature*

The highest maximum temperature recorded during the year was  $36.9^{\circ}\text{C}$  in the month of March 1959 while the lowest minimum of  $18.6^{\circ}\text{C}$  was recorded in December 1958. The monthly mean daily maximum ranged from  $34.4^{\circ}\text{C}$  (May 1959) to  $29.6^{\circ}\text{C}$  (Aug. 1958). Monthly mean daily minimum temperature ranged from  $26.1^{\circ}\text{C}$  (May 1959) to  $21.2^{\circ}\text{C}$  (January 1959).

(iii) *Humidity*

During the year under report cent per cent humidity was recorded during the month of October 1958. The lowest percentage of humidity (33%) was recorded in the month of February 1959. The monthly mean daily humidity ranged from 88% in December 1958, January 1959 and March 1959, to 95% in January 1958, November 1958 and May 1959.

(iv) *Wind velocity*

Wind velocity recorded at 10 feet from ground level was the highest in July 1958 (4.70 km. per hour) and lowest (0.60 km. per hour) in November 1958. Monthly mean wind velocity ranged from 2.0 km. per hour in December 1958 to 3.1 km. per hour in August 1958.

(v) *Sunshine*

Maximum number of hours of bright sunshine on one day was 11.80 in April 1959. In the months of June, July, August, October, November, and May there were many days on which there was practically no bright sunshine. The highest average number of hours observed was 10.00 in January 1959 and lowest number (3.20 hrs). in June 1958.

(vi) *Evaporation*

The evaporation power of the air as measured by Piche evaporimeter was observed to be the highest

(6.7 mm.) in January and March 1959 and the lowest (0.3 mm.) in June 1958. The monthly mean varied from 1.7 mm. in June 1958 and August 1958 to 5.2 mm. in February 59.

## 2. *Farm operations*

### *Cultural*

Piling of mounds in October-November and leveling of the same in December-January were carried out. The whole garden was raked, weeds and rubbish were collected and burnt. The plots were ploughed twice during May 1959 and the seeds of the green manure crop, *Crotalaria juncea* were sown broadcast and raked into the soil.

### *Manuring*

On an average 75 lb. of green manure per tree was applied in ring trenches along with 7 lb. of groundnut cake, 2 lb. of muriate of potash and 2 lb. of bonemeal. The micronutrient manurial experimental plots received 660 lb. of groundnut cake, 200 lb. of sulphate of potash and 192 lb. of bonemeal per acre. The underplanted seedlings were also manured at a rate in proportion to their age.

### *Harvest*

There were eight harvests during the year. A total of 85,701 nuts were collected as against 74,125 obtained in the previous year.

## 3. *Nursery*

1601 seednuts collected from the Station were sown in the nursery.

## 4. *Coconut Market*

The highest price fetched for coconuts during the year was Rs. 286/1000 nuts and the lowest Rs. 187/1000.

## 5. *Supply of seednuts and seedlings*

Seednuts were not supplied to the growers. 584 seedlings were sold to the local cultivators.

## 6. *Other crops*

The other important crop grown at the Station is arecanut, the usufructs of which are generally sold in



auction. An experimental plot of Sea Island Cotton was raised as an inter-crop.

7. *Supply of green manure seeds*

Although seeds of *Tephrosia candida* and velvet beans and cuttings of *Gliricidia* were collected they were not sold to the public but were utilised for planting in the Station itself.

8. *Lay out*

The farm road was repaired and the boundary bunds and inter bunds were repaired and strengthened.

9. *Building and construction*

The construction of insect proof house and the meteorological tower was completed and that of Pot Culture House and the Insectory was in progress during the period under report.

*Training*

Training on the pests and diseases of coconut and their control was given at this Station to the following persons:—

Mr. Zuniga, one Fibre Assistant from the Philippines Bureau of Plant Industry in August 1958 under instruction from the Ministry of Food & Agriculture.

Mr. N. C. Padmanabhan, a land-holder from Mahe in October 1958.

A batch of 10 Gram Sevaks and another of 5 Instructors of Basic Agricultural Schools and Extension Training Centres deputed from Kerala State and also a batch of 14 Instructors in Agriculture deputed from Madras State in November, 1958.

A batch of 17 Instructors in Agricultural Extension Training Centres and another of 11 Gram Sevaks from Madras State and a third batch of 36 Statistical Investigators from Kerala State in December, 1958.

A batch of 54 Statistical Investigators including Officers from Kerala State in January 1959.

A group of 14 Gram Sevaks from N. E. S. Blocks of Kerala State in February 1959.

A batch of 15 Gram Sevaks of Kerala State in March 1959.

A batch of 15 Gram Sevaks from Kerala State in April 1959.

**TABLE I**  
**Rainfall Statement for the period 1958-59**

Seasons	Months	1957 — 1958		1958 — 1959		Average for the past 3 years except 1958-1959	
		Rainfall in mm.	No. of rainy days	Rainfall in mm.	No. of rainy days	Rainfall in mm.	No. of rainy days
S. W.							
Monsoon	June	752.3	30	885.1	23	696.5	27
	July	565.4	27	239.7	17	383.7	23
	August	225.8	19	339.1	20	149.9	13
	Sept.	53.1	11	27.1	5	189.3	13
Total		1596.6	87	1491.0	65	1419.4	76
N. E.							
Monsoon	October	338.4	20	175.9	14	405.2	18
	Nov.	198.0	11	145.1	16	159.2	11
	Dec.	76.4	7	Nil	Nil	40.1	3
	January	Nil	Nil	Nil	Nil	1.3	8 hrs
Total		612.8	38	321.0	30	605.8	32 days & 8 hrs
Summer							
(Dry months)	Febr.	10.7	3	31.0	1	3.6	1
	March	66.3	4	66.3	3	33.4	2
	April	88.1	5	121.6	11	65.0	6
	May	326.0	19	460.5	20	320.2	17
Total		491.1	31	679.4	35	422.2	26
Yearly Total		2700.5	156	2491.4	130	2447.4	134 days & 8 hrs



T A B L E   I I

Data of Meteorological observations recorded during the period 1958-59  
( observations recorded at 0724 hrs. and 1424 hrs. (Monthly average) ).

Month	Observations at 0724 hrs.						Observations at 1424 hrs.						Picheva- poration mm.	Total rainfall mm.	Wind velocity K.M.P.H.
	Dry bulb °C	Wet bulb °C	Vapour pressure mm.	Humidity %	Dry bulb °C	Wet bulb °C	Vapour pressure mm.	Humidity %	Average maximum °C	Average minimum °C					
June	24.9	24.3	22.3	95	28.5	25.8	23.0	80	31.1	23.7	885.1	1.7	2.5		
July	25.4	24.5	22.3	92	29.1	25.6	22.4	76	30.9	24.5	239.7	2.3	2.9		
August	24.4	23.8	21.5	93	26.8	25.2	21.9	80	29.6	23.8	339.1	1.7	2.8		
September	25.3	24.2	21.8	91	30.4	25.1	20.5	64	31.8	24.2	27.1	3.0	3.0		
October	24.9	24.1	21.7	93	29.4	24.3	21.4	72	30.4	24.0	175.9	2.6	2.5		
November	24.4	23.8	21.5	94	29.9	25.7	21.8	70	32.4	23.9	145.1	2.3	2.0		
December	22.2	20.7	17.9	85	30.8	23.7	17.8	52	32.4	20.8	0.0	3.9	2.0		
January	22.3	21.0	17.8	89	32.2	25.0	19.2	55	33.7	20.6	0.0	4.9	2.0		
February	23.5	22.3	19.6	93	32.4	25.1	19.3	54	33.6	22.5	31.0	4.8	2.6		
March	24.8	23.3	20.6	92	32.8	26.2	21.3	58	34.1	23.6	66.3	4.8	2.9		
April	25.7	24.7	22.5	93	32.6	27.2	23.4	64	34.0	24.7	121.6	3.8	3.0		
May	26.8	25.4	23.8	94	30.9	27.4	24.7	74	33.3	25.2	460.5	2.6	2.8		

Note:— Rain has been recorded as monthly total.

T A B L E I I I

Summary of weather data other than rainfall for the period July 1958 to June 1959

Month	Maximum temperature			Minimum temperature			Humidity	
	in oC			in oC			%	
	Highest	Lowest	Average	Highest	Lowest	Average	Highest	Lowest Average
June '58	33.4	26.9	31.1	27.0	21.1	24.8	99	60 95
July	33.1	27.7	30.9	26.4	22.3	24.5	99	63 91
August	31.2	27.3	29.6	25.2	22.3	23.7	99	70 93
September	32.9	29.1	31.7	25.2	23.2	24.2	95	56 90
October	33.1	27.8	31.3	25.3	23.3	23.9	100	55 93
November	33.6	27.7	31.4	24.6	21.9	23.6	99	52 95
December	34.7	31.7	33.5	23.9	18.6	21.5	96	41 88
January '59	35.8	32.1	33.7	23.9	18.8	21.2	98	38 88
February	35.8	30.9	33.6	23.9	20.0	22.5	98	33 92
March	36.9	32.9	34.1	26.2	21.6	23.6	99	40 88
April	35.4	32.0	34.1	27.2	22.1	24.7	98	55 92
May	36.1	28.1	34.4	27.4	22.9	26.1	99	49 95



Summary of weather data other than rainfall for the period  
July 1958 to June 1959

	Wind velocity			Sun shine in hours			Evaporation from Piche		
	in km. per hour						Evaporimeter in mm.		
	Highest	Lowest	Average	Highest	Lowest	Average	Highest	Lowest	Average
June '58	4.2	1.3	2.4	10.10	0.00	3.20	4.1	0.3	1.7
July	4.7	1.6	2.9	10.60	0.00	5.90	3.3	0.5	2.3
August	3.9	1.9	3.1	8.60	0.00	3.80	2.8	0.7	1.7
September	3.5	1.9	2.9	10.00	3.20	7.60	3.7	1.7	3.0
October	3.4	1.4	2.5	10.70	0.00	5.80	4.8	0.6	2.7
November	3.1	0.6	2.1	10.60	0.00	7.90	3.3	1.1	2.3
December	2.5	1.4	2.0	10.90	3.10	9.40	5.7	2.7	4.1
January '59	3.0	1.3	2.4	10.90	3.50	10.00	6.7	3.7	4.9
February	3.6	1.7	2.6	11.00	5.50	9.90	6.2	3.3	5.2
March	3.5	2.6	2.9	10.60	8.00	9.20	6.7	3.3	4.8
April	3.6	2.3	3.0	11.80	1.90	8.80	6.1	2.9	3.8
May	3.5	1.3	2.8	11.00	0.00	5.60	4.9	0.6	2.6

## Approved Technical Programme for 1958-'59

### *Entomology*

#### I. *Oryctes rhinoceros* L

- 1 General Survey.
- 2 Ecological studies.
- 3 Insecticidal control, (a) laboratory trials, (b) field trials.
- 4 Biological control, (a) with exotic parasites and predators, (b) indigenous parasites and predators.
- 5 Study of the attractants and repellents.

#### II. *Nephantis serinopa* Meyr

- 1 General survey.
- 2 Insecticidal control, (a) laboratory trials (b) field trials.
- 3 Biological control, (a) Record of field parasitisation, (b) Laboratory breeding of parasites, (c) Studies on the possibility of using the exotic predator, *Platymerus rhadamanthus*, (d) detailed study of the parasites and predators.
- 4 DDT residues on coconut and other products.

#### III. *Rhynchophorus ferrugineus* F

- 1 Intensive survey of the pest.
- 2 Detailed study of the biology and bionomics.
- 3 Symptomatology.
- 4 Insecticidal control.
- 5 (a) Search for indigenous parasites and predators.  
(b) Possibility of using *Platymerus rhadamanthus*.

#### IV. *Leucopholis coneophora* Burm

- 1 General survey.
- 2 Studies on the biological and ecological aspects.
- 3 Insecticidal trials.
- 4 Search for parasites and predators.



## V. Investigations on other pests

Biology, ecology and control measures of all the pests of minor importance.

Detailed study of the biology and morphology of *Stephanitis typicus*.

Control measures of rodent pests, termites etc.

Studies on the pests of copra.

## Plant Pathology

### VI. Leaf disease

- 1 Investigations on the incidence of leaf-rot in coconut during the different months of the year.
- 2 Fungal infection in relation to the nutritional status of the palm.
- 3 Study of the lethal dose of fungicides on fungal cultures.
- 4 Comparative efficacy of fungicides in controlling leaf-rot.
- 5 Varietal resistance of coconut to *Helminthosporium* infection.

### VII. Root (wilt) disease

- 1 Studies on the infection of palm with *Rhizoctonia solani* as related to waterlogged/acidic condition of the soil.
- 2 Studies on the microorganisms present in the root sap of palms.
- 3 Fungal infection as related to carbohydrates content of roots.

### VIII. General

- 1 Study of the behaviour of seedlings raised from healthy and diseased palms.
- 2 Effect of summer irrigation on healthy and diseased palms.
- 3 Manuring-cum-spraying trials.

## *Plant Physiology*

### **IX. Physiological investigations**

- 1 Symptomatology of the wilt disease and rate of deterioration due to disease.
- 2 Continuation of the micronutrient manurial experiment adopting a modified mode of application of nutrients.
- 3 Injection trials with macro and micronutrients, chemotherapeutants, hormones etc.
- 4 Anatomical studies.
- 5 Studies on root exudation.
- 6 Inducing aerial roots for feeding diseased palms.
- 7 Transpiration, respiration and photoperiodic trials.
- 8 Root development studies.
- 9 Special treatment as per the suggestion of Shri. Pappu V. Paravara.
- 10 Miscellaneous trials.

## *Soil Chemistry*

### **X. Chemical investigations**

- 1 Studies on soils and leaf tissues from healthy and diseased coconut areas of Travancore-Cochin.
- 2 The effect of cover crop on disease.
- 3 Effect of sulphur on diseased palms.
- 4 Studies on seasonal foliar yellowing.
- 5 Intensive manuring of coconut with reference to disease.
- 6 Waterlogging in relation to disease.
- 7 Investigations on reduction products of soil and toxic substances formed under waterlogged soil conditions.
- 8 Assay of amino acids of coconut leaves.



- 9 Studies on the role of silica in plant nutrition and disease of coconut
- 10 Standardisation of the leaf sampling technique.
- 11 Advisory

## Entomology

The pests of major importance were the Rhinoceros beetle, *Oryctes rhinoceros* L., the leaf eating caterpillar, *Nephantis serinopa* Meyr., the palm weevil, *Rhynchophorus ferrugineus* F. and the root eating cockchafer beetle, *Leucopholis coneophora* Burm. Localized outbreaks of less important pests like *Contheyla rotunda* H. and *Parasa lepida* Cram. led to serious damage to foliage. *Suastus gremius* Fb. and *Gangara thyrsis* Moore invited greater attention than in previous years. *Aspidiotus destructor* Sign. was a serious pest during the hot months.

### I. *Oryctes rhinoceros* L.

#### 1. *General survey*

##### *Object*

To study the occurrence, distribution and intensity of pest infestation.

##### *Previous work*

Survey work conducted earlier had shown the presence of the beetle wherever coconut is grown, it being more common in gardens where breeding materials were in plenty.

##### *Present work*

The survey was continued in Kerala. The pest was recorded at Ambalavayal (975 M. above sea level), in Malabar. The beetle occurred in large numbers in the new plantations bordered by the Western Ghats. As recorded in previous years the pest population was abundant where breeding facilities were high.

Extension of survey work to other states was not undertaken during this period.

## 2. *Ecological studies*

### *Object*

To correlate the environmental factors with the population of the pest.

### *Previous work*

Observations were recorded on the feeding habits of the grubs of the beetle.

### *Present work*

The adults were observed in greater numbers during May, June and July; however the incidence of beetle attack decreased with the onset of the monsoon. During and immediately after the heavy rains adults occurred in greater numbers in their breeding places.

## 3. *Insecticidal trials*

### *Object*

To study the response of the pest to varying concentrations of different insecticides and effective measures to control the pest.

#### a) *Laboratory trials*

### *Object*

To evolve lethal doses of effective insecticides.

### *Previous work*

BHC when mixed with the breeding material *viz.* cowdung controlled the grub population at 0.01 per cent and the adults at 0.1 per cent concentration. Toxicity of different concentrations of Aldrin, Chlordane, Lindane, Malathion and Heptachlor against the larvae, immediately after mixing with cowdung and the residual effect of aldrin and chlordane were studied.

### *Present work*

Toxicity of Lindane, Heptachlor and Chlordane at various concentrations immediately after mixing with cowdung and after six months against the larvae and adults was studied.



i) *Effect of Lindane*

The required quantity of 25% wettable Lindane containing 99 to 100 per cent gamma isomer suspended in water was mixed with 2000 g. of air-dried cowdung to give concentration of the insecticide varying from 0.001 to 0.01 per cent. The moisture content of the mixture was maintained uniform for all the treatments. Adult grubs of uniform size and weight were introduced into the material kept in glass troughs, 10 grubs for each replication. Each treatment was replicated five times. Control with cowdung alone was also maintained. Observations were recorded for the immediate and residual effect of the insecticide for seven days at intervals of 24 hrs. and for six months at monthly intervals.

*Results*

In conformity with the observations recorded earlier Lindane was found effective against rhinoceros larvae on seven days contact immediately after mixing with the cowdung. The insecticide was toxic almost to the same extent even after six months. The percentage mortality ranged from 50-80 in the insecticidal mixture while in the control all the grubs remained normal (Table IV).

**TABLE IV**

**Effect of different concentrations of Lindane on  
0. rhinoceros grubs after seven days contact**

Strength of Lindane %	Immediate effect			Residual effect		
	N	P	D	N	P	D
0.001	Nil	40	60	Nil	50	50
0.0025	Nil	30	70	Nil	40	60
0.005	Nil	20	80	Nil	30	70
0.0075	Nil	40	60	Nil	30	70
0.01	Nil	40	60	Nil	20	80
Control	100	0	0	100	0	0

N = Normal, P = Paralysed, D = Dead.

## ii) *Effect of Heptachlor*

Experimental procedure was the same as in (i). 3 per cent Heptachlor dust was used at concentrations ranging from 0.01 per cent to 0.2 per cent.

### *Results*

Observations recorded on the immediate as well as residual toxicity of Heptachlor indicated that the potency of the insecticide considerably decreased after six months. 70 per cent of the larvae kept in contact with the insecticidal mixture immediately after mixing (0.01 %) died after seven days contact while only 10 per cent mortality was observed in the same treatment after six months (Table V).

TABLE V

Effect of different concentrations of Heptachlor on *O. rhinoceros* larvae after seven days contact

Concentration of Heptachlor %	Immediate effect			Residual effect		
	N	P	D	N	P	D
0.01	10	20	70	50	40	10
0.025	Nil	20	80	30	50	20
0.05	Nil	20	80	Nil	50	50
0.10	Nil	40	60	Nil	60	40
0.20	Nil	30	70	Nil	30	70
Control	100	Nil	Nil	100	—	—

## iii) *Effect of Chlordane*

The effect of chlordane (5% dust) at concentrations ranging from 0.01 to 0.2 per cent mixed with cowdung on adult rhinoceros beetle was studied. Five beetles of uniform size and weight (♂♂ & ♀♀) were introduced into the treated cowdung immediately after mixing and at intervals of one month up to a period of six months



and were allowed to remain there for 12 hrs. after which period they were removed to untreated cowdung. Each treatment was replicated five times.

### Result

The toxicity of chlordane towards the beetle in freshly treated cowdung, 24 hrs. after contact was appreciably low, only 20 per cent mortality was recorded at the higher concentrations *viz* 0.1 and 0.2 per cent while in the lower concentrations the majority of the beetles remained normal. However, seven days after contact with chlordane the percentage mortality of the beetles in the different concentrations ranged from 40 to 80, the toxic effect increased with increase in the concentration of the insecticide. The residual toxicity of chlordane six months after mixing with cowdung was also not very high. Only 20 per cent mortality was recorded even at 0.2 per cent concentration, 40 per cent of the beetles remained normal (Table VI).

**TABLE VI**  
**Toxicity of chlordane towards *O. rhinoceros* beetle**  
**seven days after contact**

Concentration of Chlordane %	Immediate effect			Residual effect		
	N	P	D	N	P	D
0.01	100	nil	nil	100	nil	nil
0.025	20	40	40	60	40	nil
0.05	20	40	40	40	40	20
0.1	20	20	60	40	40	20
0.2	nil	20	80	40	40	20
Control	100	nil	nil	100	nil	nil

#### b. *Field trials*

- i) *Prophylactic treatment of palms for the control of the beetle*

#### *Object*

To find out the comparative efficacy of BHC and Chlordane dusts in different combinations in checking beetle attack.

### *Previous work*

BHC and Chlordane mixed with sand, sawdust and clay were filled in the innermost three leaf-axils of palms and observations on the incidence of beetle attack were recorded. The experiment was started in 1956. The palms, 10 per treatment, are treated twice a year with 225 gms. of the insecticide mixed with an equal quantity of the filling material.

### *Present work*

The experiment was continued and observations on the incidence of beetle attack were recorded once a month. The data so far collected indicate that BHC plus clay combination is superior to the other treatments.

- ii) *Effect of spraying the breeding places of the beetle with BHC in controlling the pest*

### *Object*

As indicated in the title.

### *Previous work*

An experiment was started in 1955 in Block I of the Research Station having a standing crop of 428 palms. Fifteen trap pits containing 10 c.ft. of cowdung and decaying vegetable matter were provided in the experimental block. Of these, three pits served as untreated control and the remaining 12 pits were sprayed with BHC suspension at the rate of 360 gms. per pit. Other possible breeding places in the block and those within a belt of 180 M also were treated similarly. An untreated control plot was maintained far away from the treated one. Incidence of the pest attack was recorded every month.

### *Present work*

The experiment was continued.



### *Result*

During the period under report the incidence of beetle attack varied from 2.85% to 9.78% in the treated block and 4.3% to 14.78% in the control plot.

- iii) *Use of attractants and repellents for the control of the beetle*

### *Object*

To evolve suitable materials to attract and trap the beetle.

### *Previous work*

Mason mixture was tried as a repellent but under our conditions it was found ineffective against beetle attack.

### *Present work*

Castor oil refuse was used as an attractant. The material was kept in open mud pots scattered in Block III of the Station and observations on the number of beetle attracted to it were recorded daily.

### *Result*

The material was not effective in attracting the beetle.

## *4. Biological control*

- a) *Study of imported parasites and predators*

### *Object*

To study the possibility of utilising exotic parasites and predators for the control of the pest.

- i) *Scolia oryctophaga coq.*

### *Previous work*

Breeding of the parasite was successfully done under local laboratory conditions up to the pupal stage from the two consignments of adult wasps received in August

and September, 1957 from Mauritius. Details of the biology of the parasite up to the pupal period have been given in the annual report for 1957-58.

#### *Present work*

Breeding of the parasite was continued. During this period nine adults (3 ♂♂ & 6 ♀♀) emerged but were short-lived, their longevity under laboratory conditions was on an average 3 days, the maximum being 9 days. The average pupal period was about 426 days.

#### ii) *Platymerus rhadamanthus* Gerst

#### *Previous work*

Breeding of this predatory reduviid bug was successfully carried on in the laboratory upto the third generation.

#### *Present work*

Breeding of the bug was continued. A total of 20 adults (12 ♀♀ & 8 ♂♂) and 13 nymphs were liberated in the field at Alleppey where *O. rhinoceros* and *Nepantis serinopa* were abundantly prevalent. Under laboratory conditions the adult bug thrived well on *O. rhinoceros* and *Rhynchophorus ferrugineus* and the nymphs on *Nepantis serinopa*. The adult bugs maintained in the laboratory died without laying eggs.

#### b) *Search for indigenous parasites and predators*

#### *Object*

To find out the natural enemies of the pest and to promote biological control.

#### *Previous work*

*Oxycetonia versicolor* and an Elaterid beetle were observed feeding on the eggs of *O. rhinoceros* in the breeding places.

#### *Present work*

In continuation of the work discoloured larvae were collected from the field. The moribund larvae lost their



turgidity and plumpness. Similar symptoms were reproduced in healthy larvae under laboratory condition on injection with the body fluid of the diseased grubs. Further studies are in progress.

## II. The Coconut caterpillar, *Nephantis serinopa* Meyr

### 1. General survey

#### *Object*

To study the distribution, intensity of infestation and seasonal variation of the pest.

#### *Previous work*

Survey conducted earlier indicated the prevalence of the pest in the coastal and backwater areas of Kerala, occurring in serious form in localised pockets. The pest was also observed in the interior gardens facing open lands.

#### *Present work*

The survey was continued. Fresh pockets of infestation were noticed on the coastal tract. In Kuttanad area the infestation of the pest was more extensive than in previous years while certain other localities which were heavily infested in the past were free from fresh attack.

Survey of the pest in the Madras State revealed that about 200 hectares of coconut garden, where coconuts are interspersed with other palms, was severely affected. The infestation was virulent throughout the year.

### 2. Insecticidal control

#### a) Laboratory trials

#### *Object*

To determine lethal doses of different insecticides.

#### *Previous work*

Preliminary trials with Dieldrin, Endrin, Folidol and Diazinon proved that they were effective against

the pest at 0.2 per cent concentration. Malathion was effective at 0.05, 0.075 and 0.1 per cent strength.

### *Present work*

Trials were continued with different concentrations of Dieldrin on caterpillars of *N. serinopa*. Coconut leaflets artificially infested with *N. serinopa* were treated with various concentrations of Dieldrin (0.01 – 0.2%) prepared from Dieldrex 50% wettable powder. Each treatment was replicated ten times with ten larvae for each replication. Observations were recorded at 24 hrs. interval for a period of seven days (Table VII).

TABLE VII  
Effect of Dieldrin on *Nephantis* larvae

Concentration of Dieldrin %	Effect after seven days		
	N	P	D
0.01	43.0	nil	57.0
0.025	46.0	nil	54.0
0.05	23.0	nil	77.0
0.075	24.0	nil	76.0
0.1	25.0	nil	75.0
0.2	16.0	2.0	82.0
Control	94.0	1.0	5.0

### b) *Field trials*

#### *Object*

To control the pest with insecticides which were effective in the laboratory.

#### *Previous work*

0.2% DDT spray was found to control the *Nephantis* infestation.



### *Present work*

Since Malathion and Dioldrex gave promising results in the laboratory, field trials have been started with these two insecticides.

### 3. *Biological control*

#### a) *Parasite breeding in the laboratory*

##### *Object*

For liberation in the pest infested gardens and to serve as seed material for the regional parasite breeding stations.

##### *Previous work*

The more common larval and pupal parasites were multiplied in the laboratory and were partly liberated in *Nephantis* infested gardens and partly supplied to the regional parasite breeding stations as seed material.

##### *Present work*

As in previous years *Bracon brevicornis*, *Perisierola nephantidis* and *Elasmus nephantidis* (larval parasites) and *Trichospilus pupivora* (pupal parasite) were bred in the laboratory. The details regarding the same are given below:—

Parasite	Total No. bred	Total No. liberated and supplied.
<i>Bracon brevicornis</i>	42,490	6,996
<i>Perisierola nephantidis</i>	31,770	3,790
<i>Elasmus nephantidis</i>	518	—
<i>Trichospilus pupivora</i>	237,100	47,860

Besides these *Aprostocetus israeli* Mani & Kurian, originally recorded as a parasite on *Chiloitra infuscatellus* Snell (sugarcane early shoot borer), was found to effectively parasitise *nephantis* pupae in the laboratory. Breeding of this parasite and its liberation in the field are in progress.

*Bracon brevicornis*, previously recorded in the East Coast of India, appears to have established in the South West Coast of Kerala as indicated by its recovery from the field.

- b) *Possibility of using the predatory bug, Platymerus rhadamanthus.*

#### *Previous work*

The nymphs of the reduviid bug thrived well on *Nephantis* larvae.

#### *Present work*

A few nymphs of the predator were liberated in *Nephantis* infested gardens at Alleppey.

- c) *Detailed study of the parasites and predators*

#### *Object*

To gain knowledge on the fundamental aspects of the parasites and predators.

#### *Previous work*

Preliminary studies on the biology of the common parasites, their nutritional habits and longevity under varying conditions of temperature and relative humidity were made.

#### *Present work*

In addition to continuing the earlier studies the stinging habits and fecundity of the parasites were undertaken.

### III. The palm weevil, *Rhynchophorus ferrugineus* F.

#### 1. *General survey*

##### *Object*

To study the distribution of the pest.



### *Previous work*

The survey carried out earlier showed that the pest occurred only in certain parts of Kerala.

### *Present work*

An intensive survey carried out throughout the State revealed certain heavily infested areas. While heavy infestation of the pest occurred in coconut palntations in Alleppey, Quilon and Trichur districts, those south of Quilon were comparatively free from serious attack.

## 2. *Biology and Bionomics*

### *Object*

To find out the vulnerable stage in the life cycle of the pest so as to devise effective control measures.

### *Previous work*

Studies on the duration of the different stages of the pest were carried out.

### *Present work*

Besides confirming the earlier observations, the longevity of adults under laboratory condition, with and without food, the fecundity of females etc. were under study. From the pupal period onwards an association between the pest and a mite was observed.

## 3. *Symptomatology*

### *Object*

To study the symptoms manifested by the palms infested by palm weevil so as to evolve control measures at the proper period.

### *Previous work*

The symptoms associated with the weevil attack were recorded.

### *Present work*

Preliminary experiments were conducted in the laboratory to study the egg-laying habits and the mode of entry of the grubs into the host tissue.

#### 4. *Insecticidal trials*

##### *Object*

To study the response of the different stages of the pest to insecticidal treatments and to evolve control measures.

##### a) *Laboratory trials*

##### *Previous work*

The effect of Aldrin, Dieldrin, Endrin, Basudin, Folidol and Pedix bade emulsion was studied.

##### *Present work*

The effect of the fumigant EDB and various formulations of Pyrocon-E on the different stages of the pest is being studied.

##### i) *Effect of EDB*

##### *On eggs*

Freshly laid eggs kept in cavities scooped out in leaf stalks as well as those kept exposed on the leaf stalks were treated with 0.05 cc of the fumigant for 3500 cc volume.

None of the treated eggs hatched while 100% of those in the control hatched.

##### *On larvae*

The effect of the fumigant at 0.1 and 0.2 cc per 3500 cc volume when applied

- a) direct on the larvae established in tunnels in the leaf petiole



- b) indirect through bores separated from the tunnels of the larvae and
- c) into tunnels 24 hrs. prior to introducing the larvae.

The fumigant at 0.2 cc/3500 cc when applied direct caused 100% mortality of the larvae in 72 hrs.; but when applied indirectly was not effective thereby indicating that it has no capacity to penetrate through host tissue. Introduction of the larvae into tunnels previously treated with the fumigant resulted in 50 and 100% mortality after 24 hrs. at 0.1 and 0.2 cc/3500 of the fumigant respectively.

#### *On pupae*

The fumigant at 0.2 and 0.5 cc/3500 cc was lethal to the pupae, 100% mortality of the treated pupae being recorded.

#### *On adults*

The percentage mortality of the adults treated with 0.2 and 0.5 cc/3500 cc after 24 hrs. was 47 and 100% respectively.

In all the tests, with eggs, larvae, pupae and adults the controls remained normal.

#### ii) *Effect of Pyrocon-E*

Pyrocon-E/2, E/4, E/8, E/10, E/12, E/16, E/20, M. G. K. and Pyrethrum at 1% strength are being tested against the grubs and adults of the weevil.

#### b) *Field trials*

#### *Object*

To prevent as well as to control the pest attack.

#### i) *Prophylactic method*

#### *Previous work*

About 1200 palms inside and outside the Research Station were treated with 225 g. of 5% BHC/Chlordane

plus equal quantity of sand per tree at quarterly intervals.

*Present work*

The experiment was continued. The treated palms were infested by the pest only in rare cases.

ii) *Effect of Pyrocon-E*

*Previous work*

Injection of Pyrocon-E 1% solution for the control of the pest was freely demonstrated to the farmers.

*Present work*

Similar work was continued. About 170 palms were treated during this period.

5. *Search for parasites and predators*

*Object*

To promote biological control.

*Previous work*

Ear wigs were found to feed on the eggs and mammalian predators like mongoose and squirrels fed on the grubs of the weevil.

*Present work*

Search for parasites and predators was continued. The possibility of using the exotic predator *P. rhadamanthus* against the weevil is being explored.

IV. **The Cockchafer beetle, *Leucopholis coneophora* Burm**

1. *General survey*

*Object*

To study the distribution of the pest.

*Previous work*

Earlier survey revealed the prevalence of the pest at Tiruvalla, Mavelikkara, Sasthamkottah and South Malabar.



### *Present work*

On continuing the survey the pest was recorded at many places round about Mavelikkara and in a number of localities in the Malabar area. Apart from *L. coneophora* other species of white grubs were also observed.

## 2. *Biology and Ecology*

### *Object*

To gather detailed knowledge about the various stages of the life history of the pest and to study the pest population as related to environmental factors.

### *Previous work*

Morphology and duration of the different stages of the pest, its food and feeding habits were studied.

### *Present work*

Studies on the life history of the beetle were continued. Adults collected from the field survived only for 16 days under laboratory conditions. The incubation period of the eggs was on an average 24 days, the longevity of the 1st instar larvae was about 10-13 days and the pupal period was about 31 days. Grubs of all stages of growth were observed in the field throughout the year. Morphological and anatomical studies were continued.

## 3. *Insecticidal trials in the field*

### *Object*

To control the pest incidence.

### *Previous work*

Trials conducted earlier have shown that BHC and Chlordane dust at the rate of 25.4 and 12.7 kg per 0.4 hectare respectively satisfactorily controlled the beetle attack. In 1957 another trial was started using BHC, Chlordane, Heptachlor and Aldrin. The rates of application of the insecticides were:

BHC – 5% dust – 25.4, 50.8 & 101.6 kg per 0.4 hectare.  
 BHC – 50% Wettable – 2.49, 4.99 & 9.98 kg „ „  
 Chlordane – 5% dust – 12.7, 25.4 & 50.8 kg „ „  
 Heptachlor – 3% dust – 7.56, 15.1 & 30.2 kg „ „ and  
 Aldrin – 5% dust – 9.07, 18.14 & 27.22 kg „ „

The insecticides were ploughed into the soil and the treatments were replicated thrice. Observations on the population of the beetle were made once a month.

### *Present work*

#### **Experiment 1**

*Effect of BHC, Chlordane, Heptachlor and Aldrin on the grub population in the soil*

The experiment started in 1957 was continued. The average data on the grub population is given in Table VIII.

**TABLE VIII**

**Population of the grubs in the experimental plots**

Treatment	BHC 5%			BHC 50%			Chlordane			Heptachlor			Aldrin		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Treated	10	3	0	2	1	0	3	1	1	4	3	7	0	8	0
Control	12			3			15			15			12		

#### **Experiment 2**

*Effect of Malathion, BHC, Aldrin and Dieldrin on the grub population in soil*

The insecticides were applied twice a year, the rates of application being,

Malathion 25% (wetable) 150 g. per are  
 Dieldrex 50% „ 25 g. „  
 Aldrin 40% „ 30 g. „  
 and BHC 50% „ 75 g. „



Observations on the grub population were recorded every month in pits of size 0.6 x 0.6 x 0.6 m, and five pits per plot of 10 x 10 m. The experiment was started 1959 and is in progress.

#### 4. *Search for parasites and predators*

##### *Object*

To find out the possibility of biological control.

##### *Previous work*

No parasite was recorded. Avian and mammalian predators were observed.

##### *Present work*

The search for parasites and predators was continued.

#### V. *Other pests*

##### *Object*

To study the miscellaneous pests of minor importance, the extent of damage caused by them and to evolve effective control measures.

##### *Previous work*

Studies on the biology of the common pests were carried out. Laboratory trials for the control of certain pests and field experiments for the control of termites and coccids were started.

##### *Present work*

In continuation of the work in progress the following items were continued

- i) Life history studies of *Parasa lepida*, *Gangara thyraxis*, *Suastus gremius* and *Stephanitis typicus*.
- ii) Population studies of *Stephanitis typicus*.
- iii) Insecticidal control of termites in the nursery. Coccids infesting the inflorescence, *Herculia nigrivitta* damaging the coconut cadjans and the sunnhemp borer *Laspeyzeria tricentra* M.

iv) *Studies on the pests of copra*

The more common insect pests infesting stored copra were *Necrobia rufipes*, *Tribolium castaneum*, *Oryzaephilus surinamensis* and *Trogoderma granaria*. Trials carried out in the laboratory with Ethylene dibromide indicated that small doses of the fumigant could kill the adults. In order to study the conditions prevailing for storing copra in different places, a survey was initiated during the period.

v) *Investigations on pollinating insects* were carried out by regular collection and identification of insects visiting coconut inflorescence. Among these *Apis indica* and *A. florea* were observed more common and in large numbers.

*Plant pathology*

Investigations on the diseases of the coconut palm in general and Leaf rot and Root (wilt) disease in particular formed the major items of work in the Plant Pathology Section. Studies on the organisms associated with the diseases, the effect of environmental conditions on the occurrence and severity of the diseases and control measures were in progress.

**VI. Leaf disease - Leaf rot**

1. *Isolation of associated organisms*

*Object*

To study the causal organism (s).

*Previous work*

Examination of a large number of diseased samples proved that three fungi *Helminthosporium halodes*, *Gloeosporium* sp. and *Gliocladium roseum* were intimately associated with the disease although *Pestalotia palmarum*, *Fusarium* sp., *Curvularia* sp. and *Acrothecium* sp. were also isolated from the diseased material.

*Present work*

Isolation of fungi from diseased material was continued and the earlier observation namely the occurrence



of *H. halodes*, *Gloeosporium* and *Gliocladium roseum* in close association with the incidence of leaf rot was confirmed.

## 2. *Infection trials*

### *Object*

To study the pathogenic capability of the three fungi *H. halodes*, *Gloeosporium* and *G. roseum* under field conditions during the different months of the year to determine when the leaves require maximum protection.

### *Previous work*

A field trial was started in March, 1958 with the three fungi. Three year old healthy seedlings, 10 for each fungus were inoculated once a month throughout the year by spraying the youngest shoot with the macerated fungal mycelia. Controls were sprayed with sterile distilled water.

### *Present work*

The experiment was continued. Observations on the intensity of fungal infection were recorded as mild (x), moderate (xx) and severe (xxx). The data collected during the period under report are presented in Table IX. The infected leaves were examined in the laboratory and the inoculated organisms were re-isolated. The shoots of the control seedlings remained healthy. (Table IX appended)

## 3. *Fungal infection in relation to the nutritional status of the palm*

### *Object*

To study the effect of intensive manuring on the incidence of disease in young palms.

### *Previous work*

Manuring trials conducted on adult palms indicated the beneficial effect of the treatment in improving the general vigour of the palms.

### *Present work*

A randomized replicated field trial is being planned. This experiment is the same as item 3(e) under Chemistry.

#### 4. *Lethal dose of fungicides on fungal cultures*

### *Object*

To study the lethal dose of fungicides on fungi causing Leaf-rot in order to control the disease effectively by the use of fungicides.

### *Previous work*

Preliminary trials to study the effect of different concentrations of various copper fungicides on the growth of *H. halodes*, *Gloeosporium* and *G. roseum* in culture media were started in March 1958.

### *Present work*

The effect of several copper fungicides, viz, Kirti copper, Fungimar, Fytolan, Cupravit, Microcop, Shell copper, Sandoz blue copper, Cupramar, Cuprasana, Oil copper emulsion and Bordeaux mixture at concentrations varying from 0.05 to 1% on the mycelial growth and and spore germinations of *H. halodes* was studied following the poisoned food technique. The required quantity of the fungicides was mixed with 50 ml. of potato-dextrose agar which formed the substratum (a) in Petri dishes for the growth of the fungus and (b) on microscope slides for spore germination tests. The radial spread of the fungus in the Petri dishes were recorded every 24 hours for 5 days and the germination of the spores after 24 hours.

### *Result*

Complete inhibition in the growth of the fungus was effected by Kirti copper at 0.5%, Fungimar at 0.3% and Bordeaux mixture at 0.5% whereas with the other fungicides fungal growth decreased with increasing concentration. Yet none were lethal even at 1% concentration (Table X). Similarly germination of spores was



significantly reduced only by Kirti copper, Fungimar and Bordeaux mixture. Complete inhibition however was not observed at the dose lethal to growth.

## 5. *Comparative efficacy of copper fungicides in controlling Leaf-rot*

### *Object*

To select the fungicides best suited for giving maximum protection to the palms.

### *Previous work*

a) Leaf-rot affected palms were given the following fungicidal treatments:—

- |      |                   |            |                    |
|------|-------------------|------------|--------------------|
| i)   | Bordeaux mixture  | 1%         | four times a year. |
| ii)  | Shell copper      | „ 0.25%    | „                  |
| iii) | Kirti copper      | „          | „                  |
| iv)  | Fytolan           | „          | „                  |
| v)   | Perelan 6% dust   | 2 oz./tree | „                  |
| vi)  | Cuprasana 6% dust | „          | „                  |

There were six palms under each treatment and an equal number were maintained as control.

b) Bordeaux mixture at 1% and 0.5% were sprayed at bi-monthly and quarterly intervals on diseased trees, six trees per treatment.

### *Present work*

Experiments (a) and (b) were continued, and the experimental trees are kept under observation.

### *Result*

The results obtained confirmed earlier findings regarding the general beneficial effect on the infected trees of the fungicidal spray. Freshly prepared Bordeaux mixture still remains the best copper fungicide.

## 6. *Varietal resistance of coconut to *H. halodes* infection*

### *Object*

To study the resistance of different varieties of coconut to *H. halodes* infection.

### *Previous work*

Infection trials were conducted under field conditions on exotic variety of seedlings, viz, Philippines, Kappadan, Cochin-China, F. M. S. Big, New Guinea, Laccadive dwarf and Laccadive micro.

### *Present work*

The experiment was continued.

### *Result*

So far, all the seedlings, two for each variety were inoculated six times. In all cases successful infection was established although the severity of infection varied with atmospheric conditions, the intensity of infection being greater during the monsoon months than in summer.

### *Root (wilt) disease*

#### 1. *Isolation of associated organisms*

##### *Object*

To gather information on the organisms associated with the disease.

### *Previous work*

Examination of samples of root from diseased palms showed that three fungi namely *Rhizoctonia solani*, *R. bataticola* and *Botryodiplodia theobromae* were of frequent occurrence.

### *Present work*

Isolation of fungi from roots of diseased and healthy palms as well as other crops like arecanut and the green manure crop, *Crotalaria juncea* was made. As observed earlier, the fungi isolated more commonly were *R. solani*, *R. bataticola*, *B. theobromae* and *Fusaria*. *R. solani* occurred very rarely in healthy samples. Several isolates of *R. solani* were cultured from *Crotalaria juncea* and they showed variation from the isolate from coconut roots.



2. *Fungal infection in relation to waterlogged / acidic condition of the soil*

*Object*

As indicated above.

*Previous work*

A pot culture experiment was conducted where seedlings grown in sand under (a) waterlogged and (b) optimum moisture conditions and the pH adjusted to 4.5 were inoculated with *R. solani*. A similar un-inoculated series served as control. Seedlings in both the inoculated and un-inoculated series have remained healthy so far.

*Present work*

A similar experiment was started using green dwarf seedlings and garden soil.

3. *Studies on the micro-organisms occurring in the root sap of palms*

*Object*

For a comparative study of the nature of micro-organisms occurring in the root sap of healthy and diseased palms.

*Previous work*

The micro-organisms present in the root sap of healthy and diseased palms were assessed by the dilution plate method using different culture media.

*Present work*

The study was intensified. Root sap from 9 diseased and 6 healthy palms were collected and examined periodically.

*Results*

Bacterial population was abundant in both the healthy and diseased samples. No significant difference

between the healthy and diseased samples was indicated, the variation observed was more or less confined more to the nature of the individual roots than the palm. The root sap collected from roots which exuded sap at a greater speed invariably yielded higher number of bacterial colonies than the sap from root functioning at a slower rate.

The pathogenic nature of the different isolates is being studied.

#### 4. *Investigations to study the starch content of the root as related to fungal infection*

##### *Object*

To study whether the fungal infection in the root of the diseased palms sets in on the depletion of starch from the roots.

##### *Previous work*

Nil.

##### *Present work*

Preliminary studies on the carbohydrates content of samples of roots from healthy palms were made to standardise the method of estimation.

### VIII. General

#### 1. *Study of the behaviour of palms from nuts collected from healthy and diseased palms*

##### *Object*

To study how far the incidence of the disease in the progeny is related to the condition of the parent healthy or diseased.

##### *Previous work*

80 seedlings raised from healthy, diseased and hybrid palms were planted in Block VII during 1951. Observations on the condition of the seedlings were recorded periodically.



### *Present work*

Similar observations as in previous years were recorded.

### *Result*

Observations made on the present conditions of the palms indicate that the percentage of healthy palms is higher among those raised from seednuts collected from healthy parents than in the other categories.

### 2. *Effect of summer irrigation on healthy and diseased palms*

#### *Object*

As indicated in the title.

#### *Previous work*

9 diseased and 3 healthy palms were watered with about 25 gal. of water twice a week. 6 palms, 3 healthy and 3 diseased served as controls. Observations on the morphological conditions of the palms and yield were recorded regularly.

#### *Present work*

The experiment was continued and the scheduled observations were recorded.

### 3. *Manuring-cum-spraying trials*

#### *Object*

To study the effect of (a) manuring with and without spraying and (b) intensive manuring coupled with spraying on the diseased condition of the palms.

#### *Previous work*

A manurial-cum-spraying experiment conducted earlier indicated that the treatments were effective in controlling the disease. Hence it was proposed to study the effect of (a) manuring with and without spraying

and (b) intensive manuring coupled with spraying on the diseased condition of the palms.

- a) *Effect of manuring with and without spraying under different soil types*

The experiment was laid out in three gardens,

- i) at Krishnapuram to represent sandy soil,
- ii) at Vytilla to represent sandy loam soil and
- iii) at Monkompur in the reclaimed Kari soil, with the treatments comprising of (a) NPK + lime.

b) NPK + lime + fungicidal spray and (c) untreated control. A green manure crop of *Crotalaria juncea* grown *in situ* was also applied to the experimental palms. The fungicidal spray consisted of 1% Bordeaux mixture four times a year. Observations on the foliar condition and yield data of the palms were recorded.

### *Present work*

The experiment was continued.

### *Results*

In general manuring-cum-spraying was found beneficial, particularly in the sandy and sandy loam soils.

#### *(b) Intensive manuring-cum-spraying*

In continuation of the manuring-cum-spraying trial conducted earlier another experiment was laid out with the following modifications in the manurial treatments.

i)	N — 1.5	P — 1.5	K. 3.0 lb. per palm.
ii)	„ — 1.5	„ — 1.5	„ 4.5 „ „
iii)	„ 3.0	„ — 1.5	„ 4.5 „ „
iv)	„ 3.0	„ — 3.0	„ 4.5 „ „
v)	„ 3.0	„ — 3.0	„ 6.0 „ „



The manures were applied in split doses with an interval of one month in between. Lime at the rate of 510 K. gr. per acre and a green manure crop, *Crotalaria juncea* grown *in situ* at the rate of 46 K. gr. per tree were also applied. An unmanured and unsprayed control formed treatment (vi). All the palms excepting those in the control were sprayed with 1% Bordeaux mixture four times a year. Each treatment consisted of 30 palms in two plots.

#### *Present work*

The experiment was continued and observations on the foliar condition and yield data were recorded.

#### 4. *Effect of growing Derris elliptica around palms on the diseased condition*

#### *Object*

To study the beneficial effect of growing *D. elliptica* on the condition of diseased palms.

*Previous work* Nil.

#### *Present work*

On implementation of a suggestion from Shri K. P. Amrithanatha Iyer, a member of the Indian Central Coconut Committee, root cuttings of *D. elliptica* were planted around 10 diseased palms in June, 1959. A similar set of palms serve as controls. The palms are kept under observation.

TABLE IX  
Showing the result of infection trials under field conditions

Fungi	No. of seedlings	July Aug. Sept. Oct. Nov. Dec. Jan. Feb. March April May June											
		9	6	5	6	6	6	6	6	7	7	9	9
<i>Helminthosporium halodes</i>	Intensity of infection	xxx	9	6	4	5	4	4	2	2	1	4	8
		xx	-	-	1	1	2	1	4	4	4	3	-
		x	-	-	-	-	-	1	-	-	1	-	1
		0	-	-	-	-	-	-	-	-	-	-	-
<i>Gloeosporium</i> sp.	No. of seedlings	-	3	5	6	3	3	4	2	7	6	5	6
	Intensity of infection	xxx	-	2	2	-	-	-	-	-	-	-	-
		xx	-	3	3	2	-	2	-	2	2	3	1
		x	-	-	-	2	3	1	4	2	4	2	5
<i>Gliocladium roseum</i>	No. of seedlings	0	-	-	-	-	-	-	-	1	-	-	-
	Intensity of infection	xxx	8	5	5	5	6	4	4	2	7	7	6
		xx	8	2	1	3	-	-	-	1	2	-	1
		x	-	3	4	2	3	3	-	-	2	5	6
xxx Severe	Intensity of infection	0	-	-	-	-	3	1	3	1	3	2	2
			-	-	-	-	-	-	1	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-

Control seedlings sprayed with sterile water, remained normal throughout.



T A B L E X

Effect of fungicides on the radial growth of *H. halodes* - Radial spread  
in cm. after 5 days incubation

Fungicides tested	Concentration of fungicide %											
	0.1	0.2	0.25	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	Control
Bordeaux mixture		0.925	0.41	0.35	0							
Kirti copper	1.34	1.05	0.6	0.58	0.38	0						
Fungimar	1.24	0.3	0.29	0	0	0	0					
Microcop			1.4	1.35	1.2	1.2	1.1	1.0	0.95	0.88	0.85	
Cupramar		1.2	1.2	1.2	1.2	1.0	0.9	1.1	1.1	1.05	1.0	
Fytolan			1.53	1.75	1.8	1.6	1.6	1.55	1.4	1.4	1.08	
Cupravit			1.88	1.92	1.76	1.6	1.5	1.6	1.55	1.5	1.25	
Shell copper			1.35	1.4	1.38	1.35	1.4	1.25	1.18	1.0	1.0	
Sandoz blue copper			1.29	1.2	1.3	1.25	1.06	1.1	1.0	1.0	0.78	
Oil copper emulsion			1.1	0.99	0.88	0.84	0.76	0.76	0.72	0.71	0.66	

## *Plant Physiology*

The important items of investigation dealt with in the Plant Physiology Section relate mainly to the nutrition and physiology of the palm with reference to the Root (wilt) disease and Leaf rot. Symptomatology of the diseases and detailed studies on root development in coconut were also investigated.

### **IX. Physiological investigations**

#### *1. Symptomatology of the diseases and the rate of deterioration of the diseased palms*

##### *Object*

To study the symptomatology of the diseases and the behaviour of the palms after contracting the disease.

##### *Previous work*

Observations were recorded on the susceptible age of the palms, the visual symptoms manifested by the diseased palms and the progressive change in their condition.

##### *Present work*

a) The earlier studies on visual symptoms were extended to 16 more palms.

b) During this period investigations on the male reproductive phase of the palm as affected by incidence of diseases were also undertaken. Male flowers from apparently healthy palms and those affected by Root (wilt) disease and Leaf rot, in the different stages of infection (early, middle and advanced) were drawn. Representative samples 25 per spadix were examined in detail. A total of 1000 samples drawn from 35 adult palms and 5 seedlings were studied. Measurements of the pollen grains, the percentage of dummy pollen, germination per cent and rate of germination of the pollen grains were recorded. The effect of desiccation on the viability of the pollen is also being investigated.



## *Results*

No appreciable difference in the size of the pollen grains of the healthy and diseased palms was observed. An increase in the percentage of dummy pollen and a decrease in the percentage germination of pollen was associated with the onset and the severity of diseases. The rate of growth of the pollen tube was also adversely affected by the incidence of disease (Table XI).

c) Comparative studies on the germination of nuts collected from palms from a disease free tract *viz.* Kanyakumari District (Madras), apparently healthy palms from a diseased tract, and diseased palms (Kayangulam) were made. The data collected on 50 seednuts per each group was not significantly different.

## *2. Micronutrient manurial experiment*

### *Object*

To study the effect of micronutrients (B, Cu, Fe, Mn, Zn and Mo) as well as Mg in the prevention and control of the Root (wilt) disease and Leaf rot.

### *Previous work*

The micronutrient manurial experiment started in 1953 was in progress. The last application of the nutrients was done in September 1957. The scheduled observations were recorded regularly. Preliminary trials to ascertain the safe dose of micronutrients when administered as solution through cut ends of roots were started since it was decided to modify the mode of application of the nutrients.

### *Present work*

Detailed morphological observations and yield of the experimental palms were recorded.

### *Result*

The yield of the palms declined from 39.6 to 37.5 per tree per year and a few healthy palms contracted the

disease during this period while those exhibiting improvement continued in the same condition. Estimation of the chlorophyll, xanthophyll and dry matter contents of representative samples of leaves drawn from the experimental palms indicated that the chlorophyll and xanthophyll concentration is greater in healthy palms than in the diseased while the dry matter contents of the samples were more or less similar (Table XII).

Observations on the palms treated with micronutrients by the root injection method showed that 1/80th and 1/120th of the field dose were the optimum among the treatments tried.

### 3. *Root injection trials*

#### *Object*

To study the effect of nutrients (macro and micro), Chemotherapeutants, hormones etc. on the diseased condition of the palms.

#### *Previous work*

Urea, copper sulphate, sequestrene brand of chelated compounds, chemotherapeutant 1182 F and certain hormones were supplied to diseased palms and observations on the condition of the palms were recorded.

#### *Present work*

##### a) *Chemotherapeutant 1182 F*

The treatment was continued on 40 adult palms and 15 seedlings. Besides, two more seedlings were given the treatment during this period. All the palms are kept under observation.

##### b) *Hormones*

Injection of the hormones, B-naphthoxy-acetic (NaxA), Phenyl acetic acid (PA), 2-4, Dichlorophenoxy acetic acid (2-4, D) and 4-Chlorophenoxy acetic acid (MCPA) was continued on the experimental palms.



c) *Nitrogen in the form of urea.*

The treatment was continued and considerable reduction in the foliar yellowing of the treated palms was observed.

d) *Copper sulphate*

On continuation of the injection of copper sulphate at 7.5 g, 5.0 g and 2.5 g per tree the former two treatments were found phytotoxic.

e) *Sequestrene brand of chelated compounds*

Chelated compounds of iron, copper, sodium and calcium as 330 Fe,  $\text{Na}_2\text{Cu}$ , Na Fe and  $\text{Na}_2\text{Ca}$  respectively were continued to be injected on the experimental palms. Reduction in the general yellowing of the palms treated with  $\text{Na}_2\text{Cu}$  and 330 Fe was observed.

4. *Anatomical studies*

This item of work was included in the programme under the Second Five-Year Plan Scheme "Investigations in Virus Pathology".

5. *Studies on root exudation*

*Object*

a) To investigate the quantitative and qualitative variations in the sap exuded by the roots of healthy and diseased palms,

b) to ascertain whether wilt occurs first or the change in the pH of the sap to alkalinity, and

c) to study whether disease can be transmitted through the sap.

*Previous work*

Root sap was collected from healthy and diseased palms and the rate of exudation and pH of the sap from individual roots were determined. Rate of exudation decreased with the advancement of disease and the pH of the sap from diseased roots was invariably alkaline

while that of healthy root was acidic. The sap collected from diseased palms was injected into healthy palms and a few of the treated palms manifested disease symptoms.

#### *Present work*

The investigations on root exudate were continued. Observations recorded on the rate of exudation and the reaction of the sap from healthy and diseased palms were in conformity with the data recorded earlier. The experimental trees are kept under observation.

### 6. *Inducing aerial roots for feeding diseased palms*

#### *Object*

To study the possibility of inducing aerial roots and their utility as channels of food to ameliorate the diseased condition of the palms.

#### *Previous work*

Twelve diseased palms which were induced to grow aerial roots by the "Box method" were supplied with NP & K and the micronutrients Mn, Cu, Fe, B, Mo, -Zn as well as Mg in the form of solutions.

#### *Present work*

The experiment was continued and observations on the foliar condition of the palms were recorded.

### 7. *Transpiration and Respiration*

#### a) *Transpiration*

#### *Object*

To estimate the quantity of water that a healthy coconut palm under conditions existing at the Central Coconut Research Station, Kayangulam will transpire for a unit time (both during day time as well as night) and also to compare the transpiring capacity of healthy palms with that of diseased ones.

#### *Previous work*

Since coconut is a huge plant, its transpiration may not be easily studied by the whole plant method. Hence



the study is restricted to representative leaves. Preliminary trials were made to standardise a method for the study on coconut leaves.

*Present work*

The transpiring capacity of the leaf in relation to the age, atmospheric humidity, sunlight etc. are being studied both for healthy as well as diseased palms.

b) *Respiration*

*Object*

To estimate the amount of  $\text{CO}_2$  produced per unit time (both during day and night) by a given weight or volume of flowers and leaves from healthy and diseased trees.

*Previous work* Nil

*Present work*

Preliminary trials are being carried out by the sodium hydroxide method on flowers from healthy as well as diseased palms.

8. *Root studies*

*Object*

To collect data on the root system of healthy and diseased palms.

*Previous work*

Preliminary studies on the formation, development, rate of growth, lateral spread, colour, absorbing power, longevity of the main roots, frequency and thickness of rootlets etc., were made.

*Present work*

A systematic study of the nature and development of roots of (a) seedlings up to one year old at intervals of one month and (b) palms of different ages was carried out.

a) *Seedlings below one year old*

A special nursery was raised where nuts were sown with a spacing of 4 ft. (1.2 m). The first sample was examined three months after planting and thereafter once in a month up to a period of one year. Data on the average length of shoot, girth at collar, number of main as well as rootlets, breathing roots etc. were recorded in the different samples (Table XIII).

*Result*

The production of main roots in a seedling is about one per month. The first root continues to grow unless it meets with mechanical damage in which case it branches and the development progresses. Considerable variation in the production of rootlets and breathing roots was observed, their production increased rapidly with age. The main root of one year old seedling extended to about 8 meters (Table XIII).

b) *Palms of different ages*

The root system of two, three, five and seven-year old seedlings was studied. As observed earlier the number of main roots and their extent as well as production of rootlets and breathing roots increased with the age of the seedlings. As compared to the 11 main roots, 613 rootlets and 265 breathing roots in a one-year old seedling the corresponding roots in a three-year old and seven-year old seedlings were:

	Main root	rootlets	breathing roots
3-year old	17	3,606	3,688
7-year old	764	32,220	29,016

The root system of an adult palm of about 80 years old in the advanced stage of Root (wilt) disease was also studied. On studying 1/8th sector of the root system,



the total number of main roots was found to be only 478, of which the majority were dead. Of the functioning roots only the lower portions remained healthy and produced a few rootlets.

Observations on the root system of 15 one-year old dwarf green seedlings showed that on an average the seedlings produced 8.5 main roots per year.

9. *Special manurial treatment as per the suggestion of Shri. Pappu V. Paravara.*

*Object*

To improve the condition of diseased palms.

*Previous work*

The special treatment was given to 30 diseased trees, the annual dose of nutrients supplied being, groundnut cake 5 lb., ash 50 lb., cowdung 100 to 120 lb., common salt 10 lb. and lime 5 lb. per tree. Cowgram raised *in situ* round the trees were also supplied to the palms in ring trenches.

*Present work*

The experiment was continued and observations on the condition of the palms were recorded regularly.

TABLE XI

Condition of the tree	Number of trees	Dry pollen		Soaked pollen	Germinating pollen		
		Length $\mu$	Breadth $\mu$		Diameter $\mu$	Percentage of dummy germination	Length of pollen tube within $\frac{1}{2}$ hrs. Rate of growth per minute
Healthy	Average of 9 trees	66.4	33.2	49.8	9.75	75.5	23.9 $\mu$ .78 $\mu$ /min.
Root (wilt) disease early stage	Average of 9 trees	"	"	"	12.06	51.62	22.5 " .75 " "
Root disease middle stage	Average of 4 trees	65.16	"	"	13.29	49.43	11.2 " .37 " "
Root disease advanced stage	Average of 4 trees	64.29	"	"	22.31	33.46	13.7 " .438 " "
Leaf disease early stage	Average of 3 trees	65.8	"	"	11.55	58.46	14.27 " .47 " "
Leaf disease middle stage	Average of 3 trees	64.06	"	"	12.25	46.5	12.94 " .43 " "
Leaf disease advanced stage	Average of 3 trees	65.4	"	"	13.54	36.01	11.64 " .38 " "
Seedlings	Average of 5 seedlings	66.4	"	"	10.6	54.1	23.8 " .61 " "

TABLE XII

Healthy	Diseased — Early		Diseased — Advanced	
	Dry matter (Percentage)	Chlorophyll (% of L. trans-mission)	Dry matter (Percentage)	Chlorophyll (% of L. trans-mission)
Dry matter (Percentage)	44.44	77.37	41.32	49.86
Xanthophyll (% of L. trans-mission)	42.31	47.39	86.36	86.53



TABLE XIII

Data on root production from seedlings sown on 7-5-1958  
in a special nursery with a 4 ft. spacing

Order of seedlings	Date of observa- tion	Length of shoot	Girth of collar (diameter)	No. of rudimentary leaves	No. of seedling leaves	No. of main roots	Total No. of rootlets	Order of rootlets	No. of breathing roots on main roots	Total length of main roots
1	7-8-58	2.4 cm.	1.8 cm.	2.0	Nil	3	12	First	5	20.8 cm.
2	8-9-58	10 cm.	2.1 cm.	3.0	Nil	3	28	2nd	44	65.9 cm.
3	7-10-58	30 cm.	3.0 cm.	5.0	1	4	65	2nd	66	134.0 cm.
4	7-11-58	52 cm.	3.0 cm.	4.5	2	5	173	3rd	178	325.0 cm.
5	8-12-58	47 cm.	3.0 cm.	4.5	4	6	170	3rd	185	372.6 cm.
6	7-1-59	54 cm.	3.0 cm.	5.0	4.5	7	158	3rd	191	396.4 cm.
7	6-2-59	70 cm.	3.8 cm.	4.5	4.5	7	173	4th	183	533.5 cm.
8	6-3-59	72 cm.	4.0 cm.	4.5	5.0	7	205	5th	261	598.6 cm.
9	7-4-59	84 cm.	4.3 cm.	5.0	6.0	11	269	6th	238	584.0 cm.
10	7-5-59	118.5 cm.	4.5 cm.	5.0	7.0	11	613	6th	265	792.5 cm.

## *Social Chemistry*

Investigations on soil conditions with particular reference to the Leaf and Root (wilt) diseases are being conducted in the Chemistry Section. These investigations include studies on soils of healthy and diseased areas, soil moisture, chemical composition of healthy and diseased palm material, effect of manurial trials etc.

### **X. Chemical investigations**

1. *Study of soils of healthy and diseased coconut areas of Travancore-Cochin in relation to the chemical composition of leaves*

#### *Object*

To study the correlation between physico chemical properties of soil and chemical composition of leaves.

#### *Previous work*

A reconnaissance soil survey of healthy and diseased coconut areas of Travancore-Cochin was conducted. 169 soil samples from 64 profile pits representing the sandy, loamy, clayey and laterite soils and 68 leaf samples from trees near the profile pits were collected. Of these 47 samples were analysed for fertility status, and 12 samples for exchangeable bases and total exchange capacity.

#### *Present work*

The remaining 122 soil samples were analysed during the year for nitrogen, total and available phosphoric acid, total and available potash, lime, magnesia, iron, alumina and pH.

#### *Result*

The data of analysis summarised in Tables XIV and XV indicate that loss on ignition and nitrogen are higher in the diseased samples for all types of soils than in the healthy. No consistent variation between the healthy and diseased samples as far as the other factors are concerned was observed.



Analytical data of leaf samples show that the nutrient contents particularly nitrogen and silica are uniformly greater in the diseased samples in all the four soil types (Table XVI).

## 2. *Studies on soil temperature*

### *Object*

To gather data on the effect of a cover crop *Pueraria phaseoloides* on soil temperature in sandy soil.

### *Previous work*

The beneficial effect of growing the cover crop *P. phaseoloides* in considerably lowering the surface temperature of soil in summer was recorded.

### *Present work*

The above experiment was continued in a new plot. Observations on the soil temperature in a plot cropped with *P. phaseoloides* and a bare plot (control) were recorded regularly.

## 3. *Effect of cover crop on disease*

### *Object*

As indicated in the title.

*Previous work* Nil.

### *Present work*

The cover crop, *Pueraria phaseoloides* was grown in a 20-cent plot having 10 diseased and two healthy trees, in addition to 17 three to eight year old seedlings. The fertility status of the soil prior to raising *P. phaseoloides* and the nutrient content of the cover crop at the time of flowering were determined. Observations on the condition of the palms are being recorded.

## 4. *Manurial experiments.*

### *Object*

To study the possibility of controlling the diseases of coconut by the application of manures.

a) *Effect of lime and ash.*

*Previous work*

Lime at 8 lb. and ash at 60 lb. (in two doses) over a basal dressing of groundnut cake 7 lb., bone meal 3 lb. and muriate of potash 2 lb. per tree per year were applied to 25 diseased palms. A similar set of trees was maintained as control. Observations recorded on the condition of the palms showed no improvement, neither did the analysis of soil and leaf samples indicate any difference in the lime and potash contents of the soils and leaves, between the treated and the control. However an increase in the lime and potash content of both treated and control palms was observed.

*Present work*

The experiment was continued and the observations were recorded periodically. The analytical data collected earlier were statistically examined.

*Leaf samples.*

The calcium and potassium contents of the leaves increased irrespective of whether the trees are treated or untreated, both showing rising trends over the years. For any particular year the difference of Ca and K contents between the treated and untreated palms are not significant (Table XVII).

*Soil samples*

No increase in the potassium content of the soil was observed due to the treatments. On the other hand a decrease in the values was noticed; though not statistically significant, this decrease was common for both the treated and control. The difference between the treated and control is not significant (Table XVIII).

b) *Effect of graded higher doses of potash*

*Previous work*

Potash at 1.5 lb., 3.0 lb. and 4.5 lb. (in two doses) per tree as muriate of potash over a basal manurial application was given to the diseased trees, each treatment



being replicated five times. Analysis of leaf samples from the treated palms showed slight increase in  $K_2O$ ,  $P_2O_5$ ,  $CaO$  and  $MgO$  in trees which received the highest dose of potash.

*Present work*

The experiment was continued.

- c) *Effect of magnesium sulphate supplied through surface root*

*Previous work*

Magnesium sulphate at the rate of 2 lb. per tree in split doses was applied to diseased trees in heaps of soil around their bases. Analysis of leaf samples from the treated trees showed an increase in the nutrient content mainly of magnesium.

*Present work*

The experiment was continued.

- d) *Effect of sulphur on diseased palms*

*Previous work* Nil

*Present work*

i) Diseased trees were given the following treatments: sulphur at 2 lb., calcium sulphate equivalent to 2 lb. sulphur and magnesium sulphate equivalent to 2.0 lb. sulphur per tree per year and an untreated control. Each treatment was replicated 5 times. The experimental trees were given the usual doses of manures of nitrogen, phosphoric acid and potash. The pretreatment data on the chemical composition of leaves of the experimental palms were recorded.

ii) In another series palms under the intensive manuring trial, (item VIII, 3 b in Plant Pathology) were supplied with sulphur as mentioned in (i). Each treatment was replicated twice.

e) *Effect of high doses NPK manures*

*Previous work* Nil

*Present work*

A randomized and replicated field experiment using healthy seedlings in the pre-bearing stage as well as diseased palms is being laid out.

f) *Effect of plantomine and Fenugol*

*Previous work* Nil

*Present work*

An observational trial on the effect of plantomine and Fenugol reported to have spectacular effect on the growth and diseases of plants was started. The two compounds were applied to five diseased trees, each tree receiving 5 lb. of plantomine mixed with 75 lb. of soil and two tea-spoonfuls supplied through a hole bored in the trunk. The trees are kept under observation.

5. *Examination of tissues of healthy and diseased palms*

*Object*

To study the difference in composition of tissues of healthy and diseased palms.

a) *Macro and micronutrient content of leaves*

*Previous work*

Leaf samples collected under item 1 were analysed for macro and micronutrients.

*Present work*

Fifty-seven leaf samples from the earlier collection were analysed for nitrogen, phosphoric acid, potash, lime, magnesia and silica. The results are summarised under item 1.

Analysis of samples of leaves, kernel, husk and coconut water from trees treated with cadmium chloride for macronutrients showed that except for an increase in



potash content and a decrease in lime status (in one tree) the other nutrients were not affected by the treatment (Table XIX).

Five healthy leaf samples were analysed for the micronutrients, iron, manganese and copper. The data show that iron content ranged from 12 to 92, manganese 104 to 320 and copper 75 to 125 ppm.

b) *Defective starch metabolism and fungal infection.*

This study was undertaken in collaboration with the Plant Pathology Section Vide item VII, 4 of Plant Pathology.

6. *Studies on seasonal foliar yellowing of coconut palms.*

*Object*

To investigate the factors responsible for the intense yellowing of leaves during the S. W. Monsoon (July–August).

*Previous work*

a) *Field studies.*

Analysis of soil and water samples collected from areas where the palms exhibit severe yellowing indicated a low fertility status for the soil and the presence of acetic acid in the distillate of the water.

b) A pot culture experiment was conducted with garden soil under waterlogged and acidic condition. Foliar yellowing was observed in the seedlings within 3 to 4 months. On repeating the experiment with river sand foliar yellowing did not develop even after 10 months. The drainage water from the pots contained appreciable amounts of ferrous iron.

*Present work*

The pot culture experiment is being repeated using garden soil and green dwarf seedlings. This experiment will also be utilised for a study of the reduction products under waterlogged conditions.

## 7. *Standardisation of the leaf sampling technique.*

### *Object*

To determine the most representative set of leaflets in a palm to be drawn for chemical analysis in foliar diagnostic studies.

### *Previous work*

Earlier work has shown that if a tree contains  $n$  number of leaves,  $n/2 + 1$ th leaf is the most representative leaf and the 40th to 60th leaflets of this leaf will be a representative sample.

### *Present work*

Since the midrib of the leaflets does not yield to proper grinding it is not possible to prepare a homogeneous powder of the leaf samples. Therefore the previous work is being repeated with certain modifications. Samples were collected from every tenth leaflet from both sides of all the fully emerged leaves from a healthy tree without the basal, apical, marginal and midrib portions. A total of 1048 samples were thus collected from 34 leaves. The fresh and dry weights of the samples were determined. Analysis of the samples for nitrogen, phosphoric acid, potash, lime, magnesia and silica is in progress.

## 8. *Studies on the reduction products of soil under waterlogged conditions.*

### *Object*

To study the reduction products in the soil formed under waterlogged condition in relation to the incidence of disease.

### *Previous work*

In connection with the study of seasonal foliar yellowing of the palm (item 5), the drainage water from the pots was analysed and was found to contain reduced iron.

### *Present work*

Preliminary studies conducted during this period consisted of:



a) Analysis of the drainage water from pots containing soil from five layers of a profile pit dug near diseased trees, and kept waterlogged-with distilled water, and

b) Analysis of water extract of the soil and sub-soil water collected from profile pits dug in the low lying areas of the Research Station.

A total of 166 samples were analysed for ferrous and ferric iron, aluminium, sulphites, sulphides, ammoniacal nitrogen, pH, conductivity, total solids, oxygen requirement and nitrite nitrogen.

### *Results*

Ferrous and ferric iron, aluminium sulphites, sulphides and ammoniacal nitrogen were usually absent in the samples tested.

Analysis of the drainage water from pots indicate that water-logging for a period of 30 to 38 weeks did not appreciably alter the pH, conductivity and total soluble salts although an increase was noticed during the initial period of waterlogging which subsequently decreased. The oxygen requirement of the lower layers of the soil profile, namely III, IV and V was considerably lower than that of the upper two layers (Table XX).

The water extracts of the soil from the profile pits were uniformly low in pH, conductivity, total solids and oxygen requirements.

The analytical data on subsoil water was similar to that of water extracts of the soil. The presence of organic acids in the subsoil water was suspected and it was tested chromatographically. Separate and distinct bands of individual acids were not obtained by the technique followed. Further trials are in progress.

### *9. Advisory*

During the period under report, 25 soil samples, 11 manure samples, 7 samples of insecticides and one sample of coconut kernel were analysed and suitable advice rendered in all cases.

TABLE XIV

Showing the average analytical values for four textural classes of  
coconut soils from healthy and diseased tracts

Textural class and healthy or diseased	Moisture %	loss on ignition %	Nitrogen (N) %	Hydrochloric acid soluble				Available			PH	
				Phosphoric acid (P <sub>2</sub> O <sub>5</sub> ) %	Potash (K <sub>2</sub> O) %	Lime (CaO) %	Magnesia (MgO) %	Iron (Fe <sub>2</sub> O <sub>3</sub> ) %	Alumina (Al <sub>2</sub> O <sub>3</sub> ) %	Phosphoric acid (P <sub>2</sub> O <sub>5</sub> ) %		Potash (K <sub>2</sub> O) %
<i>Sandy soil</i>												
Healthy	0.42	0.93	0.026	0.034	0.070	0.05	0.07	0.63	1.38	0.028	0.004	5.7
Diseased	0.55	1.12	0.029	0.047	0.097	0.03	0.06	0.39	1.65	0.020	0.005	6.5
<i>Loamy soil</i>												
Healthy	1.25	3.24	0.037	0.037	0.105	0.02	0.06	2.68	6.67	0.008	0.008	5.5
Diseased	2.32	6.12	0.053	0.077	0.129	0.03	0.08	6.20	11.28	0.004	0.009	5.3
<i>Clayey soil</i>												
Healthy	5.13	5.18	0.071	0.075	0.199	0.06	0.11	4.32	10.41	0.007	0.001	5.5
Diseased	1.97	5.33	0.072	0.059	0.193	0.08	0.18	3.77	9.21	0.008	0.010	5.5
<i>Laterite soil</i>												
Healthy	3.20	9.28	0.071	0.128	0.189	0.07	0.10	6.19	20.59	0.005	0.022	5.4
Diseased	3.22	11.44	0.097	0.114	0.234	0.02	0.14	10.39	20.35	0.002	0.008	5.5



TABLE XV

Study of soils from healthy and diseased coconut  
areas of Travancore - Cochin

*Nitrogen, available phosphoric acid and available  
potash content*

Healthy				Diseased			
Lab.				Lab.			
No.'56	N%	P O <sub>5</sub> %	K <sub>2</sub> O%	No.'56	N%	P O <sub>5</sub> %	K <sub>2</sub> O%
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

*Sandy Soils*

				44	0.028	0.025	0.005
1	0.104	0.010	0.010	45	0.024	0.022	0.003
2	0.021	0.003	0.004	46	0.020	0.031	0.004
3	0.025	0.002	0.004	53	0.030	0.008	0.004
16	0.020	0.003	0.003	54	0.030	0.006	0.004
17	0.007	Trace	0.004	55	0.022	0.008	0.005
18	0.010	0.001	0.002	87	0.048	0.006	0.005
48	0.030	0.021	0.005	88	0.041	0.006	0.005
49	0.030	0.024	0.005	89	0.048	0.012	0.004
50	0.022	0.020	0.005	155	0.031	0.020	0.005
57	0.020	0.005	0.005	156	0.021	0.004	0.004
58	0.020	0.003	0.004	158	0.030	0.022	0.002
59	0.020	0.003	0.003	159	0.030	0.016	0.002
161	0.063	0.020	0.007	164	0.034	0.022	0.004
162	0.028	0.005	0.002	165	0.017	0.038	0.003
167	0.034	0.038	0.004	171	0.035	0.025	0.005
168	0.013	0.048	0.003	172	0.014	0.006	0.002
169	0.008	0.332	0.004	175	0.025	0.073	0.004
188	0.022	0.038	0.004	176	0.035	0.084	0.006
189	0.015	0.036	0.004	178	0.036	0.024	0.012
190	0.017	0.015	0.003	179	0.015	0.011	0.011
196	0.042	0.025	0.005	181	0.050	0.025	0.002
197	0.015	0.022	0.002	182	0.024	0.021	0.009
210	0.072	0.027	0.008	184	0.046	0.022	0.005

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
211	0.014	0.011	0.004	185	0.017	0.004	Trace
212	0.015	0.010	0.003	186	0.015	0.004	0.005
214	0.022	0.027	0.001	192	0.046	0.043	0.007
215	0.015	0.018	Trace	193	0.029	0.011	0.003
216	0.010	0.021	Trace	194	0.008	0.010	0.003
				206	0.030	0.029	0.009
				207	0.029	0.022	0.007
				208	0.020	0.035	0.003
				221	0.029	0.008	0.008
				222	0.021	0.006	0.007
				233	0.031	0.009	0.006
				234	0.023	0.004	0.004
				235	0.057	0.004	0.002

*Loamy Soils*

5	0.029	0.004	0.008	73	0.042	0.024	0.011
6	0.025	0.007	0.003	74	0.029	0.014	0.020
7	0.024	0.006	0.004	79	0.042	0.001	0.015
9	0.050	0.001	0.006	80	0.047	Trace	0.005
10	0.050	Trace	0.007	81	0.037	0.003	0.003
11	—	Trace	0.006	91	0.043	0.001	0.005
12	0.050	Trace	0.004	92	0.050	0.001	0.004
13	0.050	Trace	0.015	93	0.040	0.001	0.002
14	0.050	Trace	0.009	125	0.070	0.001	0.004
76	0.032	0.013	0.017	126	0.064	0.001	0.004
77	0.029	0.022	0.015	127	0.031	0.001	0.003
83	0.053	0.002	0.005	145	0.080	0.003	0.015
84	0.056	0.002	0.002	146	0.097	0.002	0.015
85	0.059	0.002	0.003	147	0.073	0.002	0.014

*Clayey Soils*

20	0.020	Trace	0.004	24	0.081	0.003	0.010
21	0.020	Trace	0.003	25	0.067	0.004	0.005
22	0.010	Trace	0.003	26	0.081	0.003	0.028
28	0.060	0.004	0.012	31	0.091	Trace	0.018
29	0.092	0.003	0.037	32	0.059	Trace	0.010



(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
35	0.095	Trace	0.011	33	0.077	Trace	0.006
36	0.050	Trace	0.004	61	0.040	0.005	0.005
37	0.063	Trace	0.007	62	0.030	0.005	0.005
39	0.059	0.004	0.006	67	0.070	0.003	0.006
40	0.106	0.003	0.010	68	0.070	0.001	0.006
41	0.038	0.004	0.005	95	0.060	0.001	0.001
42	0.057	0.004	0.011	96	0.120	0.001	0.004
64	0.040	0.003	0.007	97	0.080	Trace	0.002
65	0.040	0.001	0.014	98	0.140	0.004	0.016
70	0.070	0.007	—	106	0.048	0.005	0.015
71	0.070	0.002	0.063	107	0.051	0.009	0.003
101	0.088	0.002	0.011	199	0.078	0.003	0.006
102	0.199	0.002	0.015	200	0.150	Trace	0.009
103	0.327	0.004	0.018	225	0.046	0.023	0.028
109	0.075	0.010	0.012	226	0.011	0.006	0.005
110	0.073	0.043	0.011	227	0.080	0.003	0.025
203	0.070	0.004	0.012				
204	0.040	0.001	0.012				
229	0.020	0.029	0.010				
230	0.038	0.004	0.002				
231	0.030	0.050	0.003				

*Laterite Soils*

114	0.077	0.023	0.007	112	0.093	0.030	0.009
115	0.065	0.020	0.013	117	0.186	0.003	0.006
121	0.115	Trace	0.002	118	0.125	0.001	0.003
122	0.074	0.001	0.004	119	0.033	0.008	0.002
123	0.050	0.001	0.004	131	0.043	0.001	0.003
129	0.045	0.001	0.004	133	0.176	0.002	0.007
141	0.100	0.001	0.045	134	0.113	0.001	0.007
142	0.062	0.001	0.077	135	0.021	0.001	0.005
143	0.052	0.004	0.025	137	0.139	0.001	0.003
147	0.092	0.001	—	138	0.066	Trace	0.018
150	0.052	0.001	0.063	139	0.072	0.001	0.017
				152	0.107	0.001	0.013
				153	0.089	Trace	0.013

TABLE XVI

Analytical values for leaf samples from healthy and diseased coconut palms  
in four classes of soils

Lab. No. 1956	Healthy					Sandy soil		Diseased					
	N %	P <sub>2</sub> O <sub>5</sub> %	K <sub>2</sub> O %	CaO %	MgO %	Silica (7)	Lab. No. of 1956 (8)	N %	P <sub>2</sub> O <sub>5</sub> %	K <sub>2</sub> O %	CaO %	MgO %	Silica %
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
4	1.38	0.38	0.58	0.46	0.44	0.36	47	2.74	0.58	0.52	0.51	0.20	5.61
19	1.51	0.36	0.86	0.32	0.30	0.17	56	2.49	0.49	1.42	0.62	0.22	5.27
51	2.23	0.52	1.26	0.47	0.13	2.40	90	1.81	0.33	2.23	0.32	0.12	3.57
60	1.51	0.28	2.00	0.34	0.11	3.05	157	1.94	0.56	1.21	0.41	0.42	3.95
163	2.20	0.42	1.32	0.41	0.46	3.11	160	2.19	0.50	1.60	0.36	0.42	5.79
170	1.76	0.37	2.35	0.69	0.49	2.62	166	1.72	0.46	2.09	0.65	0.33	6.06
191	1.90	0.41	2.01	0.62	0.28	5.55	173	1.77	0.40	1.66	0.38	0.32	5.37
198	2.10	0.43	1.68	0.56	0.42	3.90	177	2.53	0.61	1.40	0.51	0.14	7.11
213	2.10	0.37	1.73	0.43	0.52	3.32	180	2.55	0.51	1.15	0.78	0.37	5.46
217	2.07	0.39	1.55	0.44	0.28	2.24	183	2.04	0.49	1.92	0.51	0.46	2.51
							187	2.17	0.51	2.73	0.70	0.27	5.94
							195	1.78	0.41	1.93	0.50	0.28	5.55
							209	2.08	0.49	1.68	0.47	0.19	5.12
							220	1.86	0.45	1.36	0.47	0.14	5.81
							223	2.32	0.45	2.32	0.40	0.17	4.48
							224	2.22	0.45	1.32	0.40	0.18	8.53
							236	2.14	0.40	1.88	0.38	0.40	2.55
Average	1.876	0.393	1.534	0.444	0.343	2.672	Average	2.12	0.47	1.67	0.49	2.25	5.22
	Healthy					Loamy soil		Diseased					
	N %	P <sub>2</sub> O <sub>5</sub> %	K <sub>2</sub> O %	CaO %	MgO %	Silica (7)	Lab. No. of 1956 (8)	N %	P <sub>2</sub> O <sub>5</sub> %	K <sub>2</sub> O %	CaO %	MgO %	Silica %
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
8	1.31	0.46	0.93	0.47	0.10	0.37	75	2.10	0.56	1.61	0.43	0.44	5.07
15	1.55	0.44	1.44	0.53	0.29	0.23	82	1.93	0.34	0.83	0.37	0.18	3.97
78	2.25	0.40	0.85	0.41	0.37	4.10	94	1.94	0.38	1.21	0.41	0.42	3.95
86	1.90	0.33	0.68	0.42	0.20	3.07	128	1.57	0.38	1.36	0.30	0.21	6.60
Average	1.75	0.41	0.93	0.46	0.24	1.94	Average	2.31	0.41	2.18	0.57	0.13	3.04
								1.97	0.41	1.45	0.42	0.28	4.51



### Clayey soil

#### Diseased

#### Healthy

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
23	1.27	0.34	1.66	0.34	0.33	0.16	27	1.51	0.41	—	0.29	0.28	0.36
30	1.67	0.31	1.53	0.29	0.30	—	34	2.25	0.40	1.23	0.95	0.68	—
38	1.86	0.24	0.75	0.48	0.32	—	63	1.67	0.29	0.22	0.52	0.20	6.07
43	1.81	0.32	1.51	0.36	0.38	—	69	1.86	0.36	1.92	0.31	0.29	5.18
66	2.04	0.36	1.96	0.24	0.30	2.49	72B	2.19	0.46	2.28	0.48	0.62	1.49
72A	1.70	0.33	1.33	0.18	0.33	4.00	99	1.89	0.35	1.54	0.60	0.30	3.64
104	1.84	0.32	1.27	0.44	0.17	3.64	100	1.61	0.26	1.58	0.59	0.47	4.22
111	2.06	0.14	2.74	0.44	0.22	3.20	108	2.42	0.09	1.51	0.33	0.52	3.57
205	2.11	0.44	1.34	0.31	0.52	4.00	201	2.41	0.47	2.01	0.45	0.72	5.71
232	1.75	0.31	0.97	0.40	0.26	4.11	202	2.18	0.42	1.53	0.54	0.91	5.54
Average	1.811	0.311	1.506	0.348	0.313	3.20	228	1.96	0.36	2.21	0.28	0.22	2.11
							Average	1.995	0.352	1.61	0.486	0.474	3.78

### Laterite soil

#### Diseased

#### Healthy

116	1.85	0.49	1.16	0.56	0.36	5.01	113	1.68	0.43	0.86	0.63	0.27	4.91
124	1.81	0.36	1.02	0.44	0.31	3.18	120	1.99	0.52	2.27	0.50	0.40	6.62
130	1.90	0.34	1.38	0.73	0.34	3.42	132	1.58	0.33	0.92	0.76	0.21	3.28
144	2.10	0.34	1.10	0.63	0.25	2.93	136	2.56	0.37	1.67	0.51	0.58	5.40
151	1.97	0.40	1.19	0.61	0.69	2.65	140	2.05	0.31	2.15	0.54	0.26	5.05
Average	1.92	0.39	1.17	0.59	0.39	3.44	154	2.19	0.42	1.90	0.61	0.32	7.49
							Average	2.01	0.397	1.63	0.58	0.34	5.46

TABLE XVII

**Lime and ash manurial experiment. Leaf samples — Mean and standard deviations (S. D.) values of Calcium and Potassium contents for the different years over pre-treatment value (1953)**

[illegible]





TABLE XIX

Results of analysis of leaves, husk, kernel and nut water of trees treated with cadmium chloride

(Leaves)					
		Tree No. 150		Tree No. 370	
Heads of analysis		Before injection	After injection	Before injection	After injection
Ash	%	3.71	4.07	4.97	4.57
Potash ( $K_2O$ )	%	0.57	0.63	0.87	1.42
Lime ( $CaO$ )	%	0.40	0.41	0.35	0.18
Magnesia ( $MgO$ )	%	0.22	0.20	0.23	0.19
Iron ( $Fe_2O_3$ )	%	Trace	Trace	Trace	Trace
Aluminium ( $Al_2O_3$ )	%	0.69	0.60	0.61	0.60
Phosphoric acid ( $P_2O_5$ )	%	0.28	0.28	0.28	0.30

(Husk, Kernel and nut water)

Heads of analysis		Husk	Kernel	Nut water Tree No. 370	Nut water Tree No. 150
Dry matter	%	14.61	19.70	0.70 gm./	0.56 gm./
		gm/Husk	gm/kernel	100 cc.	100 cc.
Ash	%	4.33	4.18	85.72	87.50



TABLE XX

Study of reduction products: Showing the results of analysis (mean values of quadruplicates) of drainage water collected from soils kept water-logged in pots

Soil layer	Period of water-logging in weeks	pH	conductivity in micro-meters	Total solid %	Oxygen requirement in p.p.m.	Nitrite nitrogen in p.p.m.
I	8	6.2	114.00	0.0102	14.20	0.3
	10	6.3	132.75	0.0121	16.53	0.08
	20	6.4	163.78	0.0162	16.75	0.16
	30	7.1	106.02	0.0085	8.1	0.19
II	8	6.0	89.68	0.0124	12.8	0.08
	12	5.8	79.04	0.0097	11.53	Trace
	22	6.1	99.56	0.0152	14.05	0.05
	32	6.2	82.08	0.0050	9.75	0.12
III	8	5.5	33.44	0.0080	2.6	Trace
	14	5.7	71.95	0.0087	4.4	Trace
	24	5.6	49.78	0.0102	2.4	„
	34	5.5	33.59	0.0031	2.2	„
IV	8	5.6	62.32	0.0102	2.6	„
	16	5.5	53.18	0.0069	11.0	„
	26	5.6	47.12	0.0085	3.4	„
	36	5.6	35.97	0.0028	1.0	„
V	8	5.9	25.8	0.0026	2.9	„
	18	5.8	60.80	0.0096	7.9	„
	28	5.7	45.22	0.0066	2.7	„
	38	6.2	27.74	0.0026	1.55	„

## Technical programme for 1959-60

### *Entomology*

#### I. *Oryctes rhinoceros* L.

1. General survey.
2. Ecological studies.
3. Insecticidal control, (a) laboratory and (b) field trials.
4. Biological control (a) by exotic and (b) indigenous parasites and predators.
5. Population studies.

#### II. *Nephantis serinopa* Meyr

1. General survey.
2. Insecticidal control, (a) laboratory and (b) field trials.
3. Biological control, (a) studies on field parasitisation, (b) breeding of the parasites in the laboratory, (c) Studies on exotic predator, *Platyperus rhademanthus*, (d) detailed studies of the indigenous parasites and predators and (e) desirability or otherwise of liberating parasites in addition to DDT spraying.
4. DDT residues on coconut and other products.

#### III.. *Rhynchophorus ferrugineus* F.

1. Survey of the pest.
2. Biology and Bionomics.
3. Symptomatology.
4. Insecticidal control, (a) laboratory and (b) field trials.
5. Search for parasites and predators.

#### IV. *Leucopholis coneophora* Burm.

1. General survey.
2. Biology and ecology.

3. Insecticidal control.
4. Search for parasites and predators.

#### V. Other pests

1. Study on the biology of pests of minor importance.
2. Population studies of *Stephanitis typicus*.
3. Control of termites, coccids, rats etc.
4. Studies on pollinating insects — Role of Honey bee in coconut cultivation.
5. Studies on pests of copra.
6. Control of Sunn-hemp borer.

#### *Plant Pathology*

#### VI. Leaf disease

1. Isolation studies.
2. Infection trials with the leaf pathogens in the field during different months of the year.
3. Study of the lethal dose of fungicides on fungal cultures.
4. Comparative efficacy of fungicides in controlling leaf-rot.
5. Varietal resistance of coconut to *Helminthosporium* infection.
6. Effect of intensive manuring on disease.

#### VII. Root (wilt) disease

1. Isolation studies.
2. Infection trials with *R. solani* in relation to waterlogged/acidic conditions.
3. Studies on the microorganisms occurring in the sap of healthy and diseased trees.
4. Studies on fungal infection of roots as related to their starch contents.



## VIII. General

1. Study of the behaviour of the palms raised from healthy and diseased parents.
2. Effect of summer irrigation on the condition of affected palms.
3. Manuring-cum-spraying trials.
4. Study of the influence of *Derris elliptica* grown on diseased trees of their condition.

### *Plant Physiology*

## IX. Physiological investigations

1. Symptomatology of the Root (wilt) disease.
2. Micronutrient manurial experiment.
3. Root injection trials.
4. Studies on root exudation.
5. Inducing aerial roots for feeding diseased palms.
6. Transpiration, respiration and photoperiodic studies.
7. Root studies.
8. Special manurial experiment as per Shri Pappu V. Paravara's suggestion.
9. Miscellaneous trials.

### *Chemistry*

## X. Chemical investigations

1. Effect of cover crop on disease.
2. Manurial experiment.
3. Effect of intensive manuring on disease incidence.
4. Studies on seasonal foliar yellowing.

5. Investigations on the reduction products of waterlogged soils in relation to disease.
6. Assay of amino acids of coconut leaves.
7. Studies on the role of silica in plant nutrition and disease of the palm.
8. Assay of micronutrients in leaves of healthy and diseased palms.
9. Advisory.

**Report of the Second Five - Year Plan Schemes.  
Approved Technical Programme for 1958-59.**

**I. Insecticidal control of the Rhinoceros beetle**

1. Study of the pre-treatment population of the pest.
2. Record of the yield data of the palms in the treated area.

**II. Ecological studies of *Nephantis serinopa* Meyr**

1. Study of the population of the pest.
2. Study of the population of the parasite.
3. Study of the environmental conditions.

**III. Studies on the microflora of coconut soils**

1. Study of the microflora of coconut soils in Kerala from diseased as well as healthy areas.
2. Collection of soil and root samples from the coconut growing areas of Madras and Mysore States and determination of the microflora of the samples.

**IV. Investigations in Virus Pathology**

1. Histopathogenic studies.
2. Serological tests.
3. Symptomatology.

4. Disease transmission trials.
5. Studies on insect population.
6. Host range studies.

#### **V. Investigations on the Physiology of the nutrition of the Coconut palm**

1. Studies on the nutritional exhaust of the coconut palm.
2. Studies on deficiency symptoms.
3. Studies on the accumulation and translocation of food in healthy and diseased palms.
4. Effect of nutrients, curatives and stimulants fed through cut ends of roots on diseased palms.
5. Absorption of nutrients by coconut in health and disease.
6. Carbon assimilation in coconut in health and disease.

#### **VI. Collection of comparative data of soils and plant tissues from healthy and diseased coconut areas of Travancore-Cochin**

1. Detailed soil survey of healthy and diseased areas of Travancore-Cochin and collection of soil samples.
2. Collection of leaf samples from healthy and diseased palms of the above regions.
3. Analysis of soil and leaf tissues collected during the survey and comparison of the data of soils and plant materials of healthy and diseased regions.



## I. Insecticidal control of Rhinoceros beetle

### *Object*

To demonstrate the efficacy of spraying manure pits and other breeding places of the beetle with BHC (0.1%) in controlling beetle attack.

### *Previous work*

A survey of the coconut gardens along the West Coast of Alleppey, Quilon and Trivandrum districts of Kerala was conducted with a view to locate a suitable site for the conduct of the experiment. Coconut gardens at West Kallada, Sasthamkotta and Mynagapally in Quilon were found to be heavily infested and hence that area was selected for running the experiment.

### *Present work*

The demonstration plot comprising of about 11 sq. k. m. and about 3000 palms was divided into seven. A control plot having about 1000 palms about a k. m. away from this was also selected. The quantity of possible breeding materials of the beetle like manure pits, dead coconut logs, decaying vegetable matter etc. in the demonstration plot was assessed. Nearly 500 manure pits and 250 coconut stumps were treated with 0.1 % BHC. Trap pits containing cowdung treated with the insecticide are being provided in the experimental plot. Fresh incidence of the beetle attack and yield data of palms in both the treated and control plots are being recorded.

## II. Ecological studies of *Nephantis serinopa*

### *Object*

To study the fluctuations in the population density of *N. serinopa* and its natural enemies in relation to ecological factors.

### *Previous work*

The coconut gardens along the coastal and backwater tracts of Alleppey, Quilon and Trivandrum districts

were surveyed. Population studies of the pest and its natural enemies, parasites and predators, were made in representative plots in the different areas. Two plots having severe pest attack were selected, one at Arattupuzha along the coastal area of Alleppey and another at Neendakara on the backwaters of Quilon.

#### *Present work*

The two centres were divided into four blocks each and the following studies were conducted:—

1) Population studies of the pest, both larval and pupal stages and its parasites and predators. Detailed observations on the population of the pest and its enemies were recorded in 25 palms.

2) Data on the effective or relative natural parasitism and the sex ratio of the moths and parasites emerged were recorded from the field collections of the pest from the adjoining areas of the experimental centres. The percentage of effective pupal parasitism ranged from 34 to 75 at Arattupuzha and 43 to 99 at Neendakara, the peak period being September to November.

3) Biology of the pest in relation to ecological factors.

4) Daily record of the weather conditions like temperature, humidity etc was maintained.

### **III. Studies on the microflora of coconut soils**

#### *Object*

To assess the role of microorganisms in the incidence of root (wilt) disease of coconut.

#### *Previous work*

Comparative studies on the soil and rhizosphere microflora of samples of soils and roots collected from pits dug near the base of healthy and diseased palms at the Research Station garden were made.



### *Present work*

During this period soil and root samples were collected from Kayangulam, Adoor, Chavara, Mavelikara, Thazhakkara and Chenganoor to represent diseased area and Quilon and Mayyanad in the healthy area. The samples were drawn from different depths from pits dug five feet away from the bole of the palms. Comparable samples were collected from the base of diseased and apparently healthy trees in the diseased gardens. From Chavara collections were made twice during the year and once from the other localities. A total of 108 samples were collected from 36 pits. The microflora namely fungi, bacteria and actinomycetes in the samples was assessed by the dilution plate method. The fungi colonized in the roots were also determined by culturing them in agar media.

### *Results*

1) In general the rhizosphere showed a greater number of microorganisms than the soil away from the roots.

2) The 'rhizosphere effect', i. e. the rhizosphere flora soil / flora readily decreased with increasing depth in the case of healthy samples from Mavelikkara and Chavara whereas it was inconsistent in the other samples.

3) The rhizosphere effect is more pronounced in the healthy samples than in the diseased.

#### 4) *Rhizoctonia solani*

A pathogenic fungus associated with the Root (wilt) disease was isolated only from some diseased samples. *Botryodiplodia*, *R. bataticola* Fusaria, *Chaetomium* etc., were the other important isolates obtained.

5) The two samples collected from Chavara varied in that the fungal population was more abundant soon after the monsoon, i. e. in August than in December.



## IV. Investigations in Virus Pathology

### 1. *Histopathogenic studies*

#### *Object*

To study the anatomical changes accompanying the external symptoms of the disease in the different parts of the palm.

#### *Previous work*

Preliminary trials were made to determine the fixing fluid, stains etc. best suited for the studies.

#### *Present work*

A number of samples of tender and mature leaf tissues were studied for nuclear changes that may accompany the disease along with comparable samples from healthy palms. Samples of mature leaves showing different types of chlorosis, flaccidity and necrosis were examined with particular reference to the mesophyll tissue.

#### *Results*

Binucleated cells were found in the ground tissue of tender leaves of both healthy and diseased palms; however a higher frequency distribution of such cells was found in the diseased samples than in the healthy.

A partial or total disintegration of chloroplasts accompanied with loss of chlorophyll was a common feature in leaves showing chlorosis. Preliminary studies of leaves showing flaccidity indicated certain structural changes in the cell wall and a quantitative variation in the conducting elements.

### 2. *Serological tests*

#### *Object*

To study the antigenic properties of the proteins of healthy and diseased palms so as to find out their differential reactions, if any, which may help in identifying and establishing the viral nature of the disease.

*Previous work* Nil

*Present work*

The precipitation test is intended to be carried out with sap of healthy and diseased palms as the source of the antigen, rabbits being used as test animals. Since it was observed that polyphenols, mainly tannins, present in the leaf sap in fairly large quantities are harmful to the test animals, trials to remove them with the proteins remaining intact are under way.

### 3. *Calorimetric trials*

*Object*

To find out easy diagnostic colour tests for the identification of the disease.

*Previous work*

Two colour tests, viz. Hutchin's and Lindner's used in the case of Stone fruit viruses were tried with a number of samples from healthy and diseased trees. Negative results were obtained with the healthy material whereas those from the diseased were inconsistent.

*Present work*

A number of tests used for the identification of ratoon stunting of sugarcane, phony peach and other stone fruit viruses and swollen shoot of cocoa were tried on samples of root, petiole, leaf and flowers drawn from a number of healthy and diseased trees.

*Results*

Trials with sections and extracts of roots, leaf and flowers yielded negative results while petioles proved to be suitable for the tests. The results indicate that tetrazolium chloride may profitably be used for further trials (Table I).

### 4. *Disease transmission trials*

*Object*

To try transmissibility of the disease employing various methods.

a) *Under field conditions*

*Previous work*

Transmission trials carried out in the open indicated the infective nature of the disease. About 70 per cent of the palms inoculated by the abrasion method of Rawlings and Tompkins were diseased while only 10-15 per cent of the control palms were naturally infected. Of the many insect vectors tried the banana lace wing bug, *Stephanitis typicus* successfully transmitted the disease to about 60 per cent of the inoculated palms. Two of the four palms inoculated by the sap transfusion method also got infected. Generally palms 6-15 years old were most susceptible to the disease.

*Present work*

Transmission trials were continued following the three methods adopted earlier with a view to find out the relationship between (i) age of the palm and susceptibility and (ii) frequency of inoculation, susceptibility and incubation period.

The results of the experiment, wherein 24 seedlings of 2-3 years were inoculated at fortnightly intervals, are given in Table II, and it indicates that while the greater frequency of inoculation supplies a greater inoculation potential thereby increasing the percentage infection of the inoculated seedlings, the incubation period remains at 8-9 months.

TABLE II

Percentage infection in 2-3 year old seedlings  
after fortnightly inoculations

Date of start- ing the expt.	Method of inocu- lation	No. of seedlings		Inoculation period
		Inoculated	Infected	
Nov. 1958	Abrasion	12	7	8-9 months.
"	Insect			
	Transmission	12	7	"
"	Control	12	3	"



Inoculation of leaf sap from trees showing chlorosis and nut-fall was also started. The palms are kept under observation.

b) *Under insect-proof conditions*

*Object*

To check up the transmissibility of the disease under insect-proof conditions.

*Previous work* Nil.

*Present work*

Two-year old seedlings procured from a disease-free area, viz., Kasaragod were planted inside the insect-proof house using steam sterilised soil. The seedlings were inoculated at fortnightly intervals both by the abrasion method, sap being collected from very tender leaves of diseased to minimise the tannin content and by feeding *S. typicus*. Each treatment was replicated six times.

5. *Studies on insect population*

*Object*

To study the population of insects visiting the palm and to try representative sample of each for their relative importance as vectors.

*Previous work*

Weekly collections of diurnal and nocturnal insects visiting the palm were made using fly-paper. *S. typicus* was the single major group of insect visiting the palm.

*Present work*

Collection of insects was continued by means of the fly-paper. Preliminary tests on a working model of a section trap are in progress.

*Results*

A greater variety of fauna was found in the nocturnal collection than in diurnal, however none of them

proved to be of importance in transmitting the disease. *S. typicus* was abundant in the diurnal collection, the population being greater in the diseased palms than in the healthy.

## 6. *Host range studies*

### *Object*

To find out the host range of the virus and also to select a suitable indicator plant.

### *Previous work*

Inoculation trials were carried out on plants falling into three categories (a) other genera of palms, (b) differentials of known virus diseases and (c) common weeds and vegetables generally found in coconut gardens. Of the palms inoculated by the abrasion method, *Areca catechu* and *Chrysalidocarpus lutescens* developed marginal necrosis and slight yellowing of leaves.

### *Present work*

Many of the plants which showed symptoms when inoculated under field conditions were raised in sterile soil under insect-proof conditions. The plants were inoculated by the abrasion method.

### *Results*

Experimental results are summarised in Table III. Although no conclusions could be drawn from the data so far obtained, inoculated plants of *Lycopersicon pimpinellifolium* consistently produced slight paling and flaccidity of leaves, stunting and delayed flowering. Systemic chlorosis and malformation of leaves of *Vigna sinensis* was also observed in the inoculated plants. Since the susceptibility of these plants was found to vary with age and environmental conditions, trials are being continued for confirmatory results.

## 7. Control measures

### Object

To evolve a suitable preventive method to check the spread of the disease and also to find out possible curative treatments.

### Previous work

A number of contact insecticides were tried against the probable vector *S. typicus*. Of the insecticides tested 0.2 per cent DDT proved superior to others in its immediate and residuary effect. Based on these results a field experiment of weekly and fortnightly spraying of DDT was started on 103 seedlings and 22 adult palms respectively keeping an equal number as unsprayed control.

### Present work

Besides continuing the field experiment six organo-phosphatic insecticides were tested at different concentrations against *S. typicus* in the field.

### Results

Of the systemic insecticides tried Rogor 40 at 0.05 per cent and Ekatox at 0.2 per cent resulted in 100% mortality of *S. typicus*. These two insecticides were superior to the others even at lower concentrations. None of the insecticides tested had any systemic action except Ekatox, (Table IV).

## V. Physiology of the nutrition of the coconut palm in health and disease

### 1. Studies on the nutritional exhaust (N.P.K. Ca & Mg.) of the coconut palm

#### Object

To estimate the quantity of nutrients, viz. N, P, K, & Mg. that a coconut palm exhausts by its growth and productivity during one year under healthy and diseased conditions.



### *Previous work*

48 palms, diseased as well as healthy, were selected for the purpose mentioned above. Observations on the condition of the palms were recorded. A few representative samples from shed leaves of the palms were analysed for P, K, Ca. & Mg.

### *Present work*

603 leaves shed from the experimental palms were collected and representative samples were drawn from them. Of these, 124 samples were analysed for total P, K, Ca. and Mg. The work is in progress.

## 2. *Studies on the nutritional deficiency symptoms on coconut seedlings*

### *Object*

To study the general foliar symptoms on coconut seedlings due to the deficiency of N, P and K.

### *Previous work*

A sand culture experiment was conducted. The nutrients, N, P and K were supplied in different combinations. Growth was maximum when the three major nutrients were supplied. Of the NP, NK and PK groups better growth was observed in seedlings which were under the treatment NP.

### *Present work*

Arrangements are in progress to repeat the experiment using large containers and green dwarf seedlings. 100 green dwarf seedlings were procured from Chawghat and has been planted in a temporary nursery. 350 seednuts of the same variety have also been obtained. The experiment will be started as soon as the containers are available.

3. *Studies on the accumulation and translocation of food in healthy and diseased palms*

*Object*

For a comparative study of the translocation and accumulation of food in the various parts of the healthy and diseased palms.

*Previous work* Nil.

*Present work*

Preliminary trials were conducted to estimate the sugars present in the lamina, midrib, petiole and roots of the coconut palm.

Preliminary studies were also carried out to compare the catalase activity of the palm in health and disease. Observations made so far indicate that the catalase activity of the palm decreases when the tree contracts Root (wilt) disease and that activity is lesser in the youngest and oldest leaves as compared to the intermediate leaves.

4. *Artificial feeding of nutrients, stimulants etc. through cut ends of roots*

*Object*

To see whether the diseased trees could be cured with the help of certain nutrients, stimulants, curatives etc.

*Previous work*

Hormones like IIA, IBA and IPA at 0.01 g. in 400 cc water per tree were supplied to 18 palms through cut ends of roots at quarterly intervals. The foliar condition of the palms was recorded.

*Present work*

The root injection of the hormones was continued. Besides this, studies on the effect of nitrogenous chemicals like urea and ammonium sulphate and of ferrous sulphate and magnesium sulphate on palms showing

physiological yellowing and yellowing coupled with Root (wilt) disease have been started. Chlorophyll and xanthophyll content of leaves of these palms are being estimated.

## VI. Collection of comparative data of soils and plant tissues from healthy and diseased coconut areas of Travancore-Cochin.

### *Object*

To correlate the results of analysis of soils and leaf tissues from healthy and diseased areas.

### *Previous work*

The Research Station garden (sandy area) and a few gardens at Changanacherry (laterite area) were surveyed in detail on the lines of the All-India Soil Survey Scheme.

### *Present work*

A detailed soil survey of 12 villages in Neyyattinkara taluk covering an area of 77,000 acres of healthy tract and two villages in the Karthigapally taluk comprising 11,000 acres of diseased tract was conducted. For the survey and collection of soil samples each village was taken as a unit and sites for profiles were fixed after a reconnaissance survey to study the topographical features and soil variations. The profile pits were dug 4 ft. square and 6 ft. deep or till the water table or an impervious layer was met with. Profile characters like horizon, depth, thickness, colour, structure, texture, reaction, permeability etc. were recorded. Information about parent material, slope, drainage, ground water etc. were also recorded from Neyyattinkara taluk.



Ninety-three soil samples were collected from 29 profile pits and 31 leaf samples from trees near the pits. From Karthigapally taluk 23 soil samples were collected from 7 profiles and 9 leaf samples were drawn from trees near the pits.

### *Results*

The soil types met with in Neyyattinkara taluk ranged from sandy, sandy loam, black clay loam, red loam, laterite to gravelly laterite. The characters of typical profiles are presented in Tables V, VI & VII. Sandy and sandy loam types of soils were found in the two villages in the Karthigapally taluk.

Forty soil samples were examined for chemical and mechanical composition, organic carbon, base exchange capacity and exchangeable bases. Fifteen leaf samples were analysed for nitrogen, phosphoric acid, potash, lime, magnesia and silica.

TABLE I

Colour reaction of T. S. of petioles when treated with the various test solutions

Treatment	Antoin's (Ratoon stunting)	Farrar (Ratoon stunting)	Kenknight (Phony peach)	Hutchins (Phony peach)	Lindner's (Stone fruit Viruses)	Tinsley & Usher (Swollen shoot of cocoa)
Chemicals used	2-3-5 triphenyl tetrazolium chloride	3% H <sub>2</sub> O <sub>2</sub> - conc. HCl.	ZnCl <sub>2</sub> : phlorogluci- nol : HCl : 10 : 1 : 1	30% HCl in methanol	NaOH + ZnSO <sub>4</sub> + Sodium citrate	Normal NaOH
Healthy	Colour of the solution Deep pink	Vascular bundles Greenish yellow	Vascular bundles pinkish red	Sections from reddish brown	No reaction	Slightly brown
Diseased	Light pink	Slightly less than healthy	Pinkish red	Slightly less	Slightly brown	"
Healthy	Deep pink	Greenish yellow	"	No reaction	Slightly brown	"
Diseased	Light pink	Greenish yellow	"	"	No reaction	"
Healthy	Deep pink	Greenish yellow	"	"	"	"
Diseased	Very light pink	"	"	"	"	"

TABLE III

List of host plants inoculated by leaf sap of diseased palms by the abrasion method

Name of host plant	No. inoculated	No. "infected"	Symptoms
<i>Phaseolus lunatus</i>	12	—	Nil
<i>Vigna sinensis</i> Pusa var. Phalguni	28	9	Chlorosis and malformation of leaves.
<i>Vigna sinensis</i> Pusa var. Bursatii	20	5	"
<i>Cyamopsis tetragonaloba</i>	12	—	Nil
<i>Crotalaria juncea</i>	12	—	Nil
<i>Lycopersicon pimpinellifolium</i>	43	22	Flaccidity and paling of leaves.
<i>L. esculentum</i>	12	—	Nil
<i>Cucumis</i> sp.	8	—	Nil
<i>Trichosanthus anguina</i>	14	6	Paling of leaves and comparative stunting of plants
<i>Momordica chirantia</i>	10	—	Nil
<i>Physalis peruviana</i>	10	—	Nil
<i>Acanthospermum</i> sp.	8	6	Slight flaccidity of leaves
<i>Hibiscus esculentus</i>	8	—	Nil
<i>Datura</i> sp.	12	—	Nil
<i>Manihot utilisima</i>	12	—	Nil
<i>Musa</i> sp.	48	—	Nil
<i>Areca catechu</i>	10	—	} Monthly inoculations on these are continued.
<i>Chrysalidocarpus lutescens</i>	4	—	
<i>Kentia</i> sp.	4	—	
<i>Cocos plumosa</i>	3	—	



TABLE IV

Percentage mortality of *S. typicus* when fed for  
24 hrs. on leaves sprayed with insecticides  
(Average of 3 replicates)

Treatment Concentration		Incubation period of insecti- cide on leaf in days				
	%	1	7	14	21	28
Control		10	15	5	20	10
Rogor 40	0.0125	95	90	20	25	15
"	0.025	85	25	10	20	20
"	0.05	100	45	30	60	35
Basudin 20 E	0.0125	25	40	35	35	15
"	0.025	25	25	50	30	20
"	0.05	40	20	30	40	15
Malamar	0.0125	60	25	40	15	15
"	0.025	55	25	35	15	20
"	0.05	70	40	30	20	35
H. E. T. P.	0.05	15	10	25	35	Data not collected
"	0.10	20	20	30	25	
"	0.20	20	30	35	30	
Ekatox	0.05	70	25	25	25	
"	0.1	80	50	30	30	
"	0.2	100	70	30	35	
Ekatin	0.05	60	30	20	10	
"	0.1	55	30	40	25	
"	0.2	65	30	35	15	

TABLE V

Showing profile characters of a sandy soil tract  
Pit I Kunnathukal 'B' Garden of Sri Sukumaran Nair.  
(Sandy loam)

Horizon	A1	A2	B
Depth	0-12"	12"-26"	26"-57"
Thickness	12"	14"	31"
Boundary	Gradual	Gradual	Gradual
Colour	Slightly brown	Brown	Yellowish white
Moisture	Slightly moist	Wet	Wet
Colour of mottling	Nil	Nil	yellow
Structure	Structure-less	Structure-less	Structure-less
Texture	Sandy loam	Loamy sand	Loamy sand
Consistence	Loose	Slightly sticky	Slightly sticky
Concretion	Nil	Nil	Nil
Root-distribution	Roots abundant	Few Roots	Very few.
Reaction	pH 5.5	pH 5.5	pH 5.5
Carbonate	Nil	Nil	Nil
Special feature	Nil	Nil	Nil
Permeability	Rapid	Rapid	Slow
Remark:	Water table at 5'		

TABLE VI

Showing profile characters of a red loam tract  
Pit III Kunnathukal 'A' Garden of Sri Sivasankara Pillai  
(Red loam)

Horizon	A1	B1	B2
Depth	0-1'	1'-2'	2'-5'
Thickness	1'	1'	3'
Boundary	Gradual	Gradual	g
Colour	Dark brownish red	Dark red	Red
Moisture	Moist	Moist	Moist
Colour of mottling	Nil	Nil	Nil
Structure	Structureless	Structureless	Blocky
Texture	Loamy	Loamy	Loamy
Consistence	Dry-Soft	Soft and Wet-Sticky	Soft
		sticky & plastic.	
Concretion	Nil	Nil	Nil
Root-distribution	Roots of coconuts-abundant	Roots abundant	Very few roots
Reaction	—	—	—
Carbonate	Nil	Nil	Nil
Special feature	Nil	Nil	Nil
Permeability	Moderate	Moderate	Very slow
Remark	Soil very hard below		



**TABLE VII**

**Showing profile characters of a laterite tract**

**Pit 3 Chenkal**

(Laterite Soil)

Horizon	1st foot	2nd foot	3rd foot
Depth	0 – 12"	12" – 24"	24" – 36"
Thickness	12"	12"	12"
Boundary	not clear	not clear	not clear
Colour	2.5 YR 2/6	2.5 YR 2/6	7.5 YR 6/6
Moisture	Moist	Moist	Moist
Colour of mottling	„	„	Kaolin present
Structure	structure- less	structure- less	structure- less
Texture	Loamy	Loamy	Loamy
Consistence	Loose	Loose	hard
Concretion	Nil	Nil	Nil
Root-distribution	Coconut- roots	Coconut- roots	Few coconut- roots
Reaction	...	...	...
Carbonate	Nil	Nil	Nil
Special feature	...	...	...
Permeability	Moderate	Moderate	Very slow
Remark	Below 3' laterite formation.		

## **Technical programme for 1959-'60.**

### **I. Insecticidal control of the Rhinoceros beetle**

1. Study of the incidence of the pest in the treated and control plots.
2. Treatment of the breeding places of the beetle.
3. Provision of trap-pits.
4. Record of yield of the palms.

### **II. Ecological studies of *Nephantis serinopa***

1. Population studies of the pest and its parasite complex.
2. Effect of the parasites liberated in the field on the population of the pest.
3. Record of field parasitisation.
4. Studies on the biology of the pest in relation to season.
5. Studies on hyperparasitism, superparasitism and multiparasitism.
6. Record of ecological conditions.

### **III. Studies on the microflora of coconut soils**

1. Evaluation of the microflora of coconut soils from healthy and diseased tracts.
2. Studies on the seasonal variation of the microbial population.
3. Investigations on the microbiological activity in the soil in the healthy and diseased tracts.

### **IV. Investigations in Virus Pathology**

1. Histopathogenic studies.
2. Serological tests.
3. Diagnostic tests.
4. Disease transmission trials.

5. Studies on insect population.
6. Host range studies.
7. Control methods.

#### **V. Physiology of the nutrition of the coconut palm in health and disease**

1. Continuation of the studies on the nutritional exhaust (N. P. K. Ca. & Mg.) of the coconut palm in health and disease.
2. Studies on the nutritional deficiency (macro) symptoms restricted to coconut seedlings under pot conditions.
3. Studies on the accumulation and translocation of food in healthy and diseased coconut palms.
4. Artificial feeding of certain nutrients, stimulants, curatives etc. through the cut ends of roots and to study their reactions particularly on diseased palms.
5. Absorption of nutrients by coconut palm in health and disease.
6. Carbon assimilation in coconut palm in health and disease.

#### **VI. Collection of comparative data of soils and plant tissues from healthy and diseased coconut areas of Travancore-Cochin**

1. Detailed soil survey of healthy and diseased areas of Travancore-Cochin and collection of soil samples.
  2. Collection of leaf samples from healthy and diseased palms of the above regions.
  3. Analysis of soil and leaf tissues collected during the survey and comparison of the data of soils and plant materials of healthy and diseased regions.
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## APPENDIX IV

### Secretary's Note

*Subject No. 11.* Progress Report on the Central Coconut Research Station, Kasaragod for the year ended 30th June, 1959.

A copy of the progress report mentioned above, received from the Joint Director, Central Coconut Research Station, Kasaragod is attached. Copies of the summary of the report have been sent to the Indian Council of Agricultural Research for scrutiny by the Scientific Committees of the Council. Their comments on the report are awaited.

During the year under report a total number of 12,376 seedlings were distributed from the nursery at the station. Besides, a total number of 92,075 seed coconuts were procured and supplied to the States of Assam, West Bengal and Tripura under the seednut supply scheme.

During the calendar year 1958, a total number of 2,90,283 nuts were obtained from the coconut palms at the station. This is 7.3 per cent more than the yield obtained during 1957.

The latest position regarding the various construction works at the station is as follows:—

1. *Laboratory-cum-office building.*

An amount of Rs. 3,930.00 being the estimated cost for installing an electric pump set for providing water supply to the new laboratory building has been remitted to the Central Public Works Department.

2. *Glass house (Second Plan).*

The work is in full swing and it is expected to be completed by the end of November, 1959.

3. *Garage (Second Plan).*

The construction has been completed and the building handed over to the Joint Director.

4. *Hostel for trainees (Second Plan).*

The Government of India's administrative approval of the estimates and the expenditure sanction have been received. Necessary provision for the work has been made only in the Revised Budget Estimates (Part II) for 1959-'60 of the Committee. The estimated cost of the building will be remitted to the Central Public Works Department after the Government of India's sanction for the Revised Budget Estimates for the current year is received.

*Remarks of the Committee on the previous year's report and action taken thereon.*

The Committee had adopted the progress report for the year ended 30-6-1958 as a record of satisfactory work subject to the remarks (1) that as the correlation between the leaf area of a coconut and the nut yield had not yet been determined, studies regarding this aspect should be undertaken; (2) that with regard to the figures given under the headings "Study of seedlings", "Study of indigenous varieties" and "Trial of new varieties" in the report, the number of plants on which the summary is based should be stated, (3) that the figures regarding the results of the higher and lower doses of fertilisers require to be checked up and explained as well as the statement regarding the relation between the quality of the nut and the application of fertilisers, (4) that when planting exotic varieties, the West Coast Tall variety should be planted as a control for comparison, this being a standard variety and (5) that steps should be taken to try to ensure better arrangements for the transport from abroad of nuts for experimental purpose.

The Joint Director, to whom the Committee's observations were communicated, has reported (1) that attempts will be made to work out the correlation between the leaf area of the palm and the nut yield, (2) that the number of plants on which the summary regarding study of seedlings etc., is based will be given in future reports, (3) that the figures regarding the results of the higher and lower doses of fertilisers have been



checked up and found correct and that the observations made under the concerned table regarding the relation between the quality of the nut and the application of fertilisers which was originally couched as "The tendency for the quality of nut to depreciate with the increased dosage of nitrogen and to appreciate with increased dosage of potash which was observed last year was in evidence this year also. The differential effect is much more on some characters than others" may be modified to read as "The tendency of the quality of the nut to depreciate with increased dosage of nitrogen is seen in almost all the characters studied. In the case of phosphoric acid, the effect is, in general, not appreciable. Potash has given varying results — some characters appear to be benefited while others are not", (4) that the West Coast tall variety has been planted as control wherever possible and (5) that the Indian Council of Agricultural Research and his office have taken action to ensure better arrangements for the transport of seednuts from abroad. It may be mentioned in this connection that the Indian Embassy in the Philippines have recently despatched 4 (four) sacks of seed coconuts from Manila to Mangalore by air.

The Committee had also decided that the progress report should be got printed and copies supplied to the members of the Committee and workers of research stations. This is being done. The report for the year ending 30-6-1958 has already been printed and copies supplied to the members etc.

The report may be considered first by the Agricultural Research and Development Sub-Committee (Research Wing).

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# CENTRAL COCONUT RESEARCH STATION, KASARAGOD.

Detailed report of work done during the year  
ended 30-6-1959.

## I. BOTANY AND BREEDING

### I. Introduction and study of exotic varieties of Coconut.

#### (a) *Procurement of seednuts:*

Introduction of promising coconut varieties and types from the different coconut growing countries of the world to assess the relative performance of the exotic and indigenous types, as also for fundamental studies and use in hybridisation experiments had been an important item of work in this Station. Consignments of seed coconuts were received last year from Philippines, West Indies, Fiji and Viet-Nam. During the year under report, more consignments were obtained from West Indies and Ceylon. Details of consignments received are given below:—

Source	Date of receipt	Variety	No. of nuts received.	No. of nuts sprouted in the Nursery
1. West Indies	19-8-'58	St. Vincent	20	3
2. Ceylon	4-3-'59	Gon Thembili	12	4
		Ceylon Tall	12	1
		King Coconut	12	7
		Dwarf Green	11	1

Number of nuts germinated in the case of consignments received last year are:

Source	Variety	Number of seedlings	Condition of seedlings
1. Philippines	San Ramon	17	good
	Mangipod	1	"
2. Fiji	Grey	2	poor
3. West Indies	Blanchisseuse	1	"

Other varieties like *Coconino* of Philippines, *Fiji Red*, *Tobago* of West Indies, *Cay dua lua lai* and *Cay dua bung* of Viet-Nam did not survive in the nursery. Since these seednuts are transported by surface route, they become spoiled by the time they reach here. Hence arrangements are being made to get the consignments by air.

(b) *Study of adult palms:*

The study of adult palms of 21 exotic varieties planted in this Station was continued. Of these, Laccadive, Philippines, Fiji, F. M. S., S. S. Green, Andaman and Kappadam gave an annual yield of more than 100 nuts. Laccadive and Fiji continue to exhibit the character of high setting percentage and Philippines that of high female flower production. Philippine laguna (tree No. 36) produced one *makapuno* nut (one with soft buttery kernel and viscous fluid inside). Since the *makapuno* nuts as a rule fail to germinate, attempts were made to transplant the embryo of this nut into a normal nut, but without success.

(c) *Study of newly introduced seedlings:*

Observations on the vegetative characters of the different types of exotic seedlings planted in earlier years in the Station were continued this year also. Details of observation on the various types planted in Hill Block West on 8th October 1955 are given below:—

Variety	No. of seedlings	Average No. of leaves produced in the year	Average No. of leaves produced so far
1. San Ramon	4	9.2	37.5
2. Borneo	4	8.5	35.7
3. Seychelles	4	6.0	27.5
4. Jamaica	4	7.7	33.0
5. Malaya	4	8.7	35.2
6. B. S. I.	4	8.2	31.7
7. Kenya	4	7.5	27.7
8. Zanzibar	4	7.2	30.0
9. Guam I	4	8.2	33.7
10. Guam II	4	8.5	32.7
11. Guam III	4	8.5	31.5
12. West Coast Tall	21	5.8	23.0



The above data clearly show that as far as vegetative characters of the seedlings are concerned, those of San Ramon, Malaya, Borneo and Guam continue to maintain their superiority. The West Coast Talls planted in the same block for comparative study are in this respect far behind the exotics.

Among seedlings of the different types planted in R. S. 40, on 31st August 1956, those of Jamaica, Java, Malaya and Philippines appear to be better than the others in the same plot. Details of observations are given below:—

Variety	No. of Seedlings	Average No. of leaves produced in the year	Average No. of leaves produced so far
1. Borneo	7	6.5	26.2
2. Jamaica	8	7.7	28.6
3. Seychelles	7	6.6	22.8
4. Malaya	3	7.6	29.0
5. Kenya	4	6.7	26.0
6. Guam I	3	6.6	28.6
7. Guam II	3	7.0	28.0
8. B. S. I.	3	7.3	27.3
9. Java	3	7.6	23.6
10. Zanzibar	2	5.0	20.5
11. Panama	1	4.0	16.0
12. Laccadive			
ordinary	4	7.5	21.5
13. Laccadive dwarf	4	5.2	19.7
14. Laccadive small	3	7.0	19.6
15. Laccadive micro	3	5.6	17.6
16. Philippines	6	8.0	21.5
17. Cochin China	2	6.5	21.5
18. Fiji	8	6.6	20.7
19. Andaman	4	6.0	18.2
20. Andaman dwarf	3	6.6	19.6
21. Spicata	5	7.2	21.4
22. F. M. S.	4	6.7	19.2
23. S. S. Green	3	7.0	20.0
24. S. S. Apricot	2	7.0	19.5
25. New Guinea	6	6.6	20.0

In the case of Malayan and Andaman varieties planted in R. S. 29 South, Tall Green of Malaya and Andaman Round continue to maintain vigorous growth characters. The rate of production of leaves of these types is given below:—

Variety	No. of seedlings	Average No. of leaves produced in the year	Average No. of leaves produced so far
<i>Malayan types.</i>			
1. Tall Green	2	10.5	60.0
2. Dwarf Yellow	2	10.0	58.0
3. Dwarf Green	3	10.6	56.0
4. Dwarf Orange	2	10.5	53.5
<i>Andaman types.</i>			
1. Andaman Round	2	10.0	53.0
2. Andaman strongly ribbed Round	2	9.5	50.5
3. Andaman triangular large nut	2	8.5	46.0
4. Andaman normal nut	2	9.0	49.0

During the year under report one seedling of Malayan Dwarf Yellow and another of Dwarf Orange flowered. These seedlings have taken more than six years to flower, which is an unusually long period for any dwarf type.

Seedlings of a few exotic types planted in Field XI S. E. on 4th July, 1955 are also under study and the observations are recorded below:—

Variety	No. of Seedlings	Average No. of leaves produced in the year	Average No. of leaves produced so far
1. Seychelles	3	7.3	32.3
2. San Ramon	3	9.6	39.0
3. Laccadive micro	3	7.3	30.3

## II. Study of indigenous forms.

The seedlings of some promising indigenous forms planted in this Station are being observed regularly for their growth characters. Details of observations are given below:—

Variety	No. of seedlings	Average No. of leaves produced in the year	Average No. of leaves produced so far
1. Gangabhavani	5	8.0	32.0
2. Rangoon kobbari	2	9.0	34.0
3. Verri Kobbari	4	7.2	27.2
4. Orissa	6	8.1	32.3
5. Gangabondam (planted on 31-8-'56)	4	6.2	18.0
( „ on 4-7-'55)	3	9.0	33.6

Among the first three types from East Godavari, the seedlings of Rangoon Kobbari show more vigorous growth than the rest.

## III. Comparative study of tall, tall x dwarf, natural cross dwarf and dwarf seedlings.

The study of seedlings of each of the above groups planted in S. B., R. S. 39/3b on 25th August 1952 was continued. Details of observations are given below:—

Name	No. of seedlings planted	No. of seedlings flowered
1. West Coast Tall	5	—
2. Tall x Dwarf (hybrids)	6	—
3. Chowghat Dwarf Orange (N. C.)	6	1
4. Chowghat Dwarf Yellow	19	3
5. Chowghat Dwarf Green (medium)	2	2
6. Chowghat Dwarf Green (small)	5	5
7. Dwarf Green, Nileshtar	6	3



Among the seedlings listed above, all of Chowghat dwarf green have flowered. Due to the sandy nature of the soil in the above plot, the performance of the seedlings, in general, is not satisfactory. While most of the dwarf seedlings have come to the bearing stage, none of the hybrids have flowered.

A few seedlings each of natural cross dwarf and pure dwarf, raised from seednuts of green and yellow dwarfs obtained from Chowghat were also planted in East Block on 4th September 1957 for further studies on the performance of the green and yellow natural cross dwarfs and for comparative study of the performance of the pure dwarfs and natural cross dwarfs. Details of this study are given below:-

Variety	No. of seedlings	Average No. of leaves produced in the year	Average No. of leaves produced so far
1. Green (N. C.)	4	8.5	21.2
2. Green (pure dwarf)	3	8.6	23.7
3. Yellow (N. C.)	13	6.9	21.0
4. Yellow (pure dwarf)	8	6.8	21.0

#### IV. Study of species of *Cocos* other than *C. nucifera* L.

Besides *C. nucifera* L., other species of the genus like *C. plumosa* Hk., *C. schizophylla* Mart., *C. coronata* Mart., and *C. australis*, all natives of Brazil, are introduced in this Station. Maintenance of the material for possible use in interspecific hybridisation and their cytological examination alone are in the programme. The chromosome number in *C. australis* is observed to be  $n = 15$ . Detailed study of meiosis in this species is in progress.

#### V. Study of mother palms and their progenies.

This item of work has been taken up with a view to follow the yield performance of the progenies of some of the high yielding mother palms of the Station, whose yield data for a number of years are known. It is also part of the programme to follow up the yield of some of the low yield group of palms which will be taken up

later. During the year under report, open pollinated progenies of 23 high yielders were planted in the Station. Of these, 93 seedlings of 19 palms were planted in Beach Block and 17 seedlings of 4 palms in East Block in July 1958. Observations on the vegetative characters of the seedlings are regularly taken and recorded to see whether the seedling characters are correlated with yield performance. Details of palms selected and the seedlings planted are given below:-

No. of mother palm		Average yield of mother palm for 5 years ('54-58)	No. of seedlings planted
<i>Beach Block.</i> (Planted on 7-7-'58)			
1.	R. S. 29 S. (277)	94.6	11
2.	R. S. 29 N. (315)	113.2	9
3.	R. S. 39/2. (286)	94.4	7
4.	O. C. (22)	60.2	7
5.	O. C. (43)	85.0	3
6.	R. S. 29 S. (61)	84.6	5
7.	O. C. (53)	123.2	5
8.	R. S. 29 S. (359)	88.8	3
9.	R. S. 29 S. (346)	97.4	5
10.	O. C. (34)	118.4	4
11.	R. S. 29 N. (337)	131.2	5
12.	R. S. 29 N. (285)	147.2	3
13.	R. S. 41 (588)	127.2	3
14.	R. S. 39/2 (138)	105.4	5
15.	R. S. 41 (491)	91.4	3
16.	R. S. 39/2 (143)	90.0	4
17.	R. S. 41 (489)	97.0	2
18.	R. S. 39/2 (205)	164.8	5
19.	R. S. 39/2 (144)	102.6	4
Total No. of seedlings			<u>93</u>
<i>East Block.</i> (planted on 9-7-'58)			
20.	R. S. 27 S. (109)	87.4	4
21.	R. S. 39/2, 1. (210)	111.4	5
22.	R. S. 27 S. (171)	80.6	4
23.	R. S. 29 N. (170)	102.4	4
Total No. of seedlings			<u>17</u>
Total for the two blocks			<u>110</u>

## VI. Hybridisation.

Hybridisation work for the season was started in January and continued till the middle of May. Details of work done are given below:—

### (a) *Economic crosses.*

The following crosses for the production of hybrids of proven superiority were repeated for the supply of seedlings to the cultivators.

1. Tall ♀ x Dwarf ♂
2. Tall ♀ x Gangabondam ♂

### (b) *Experimental crosses.*

The following experimental crosses were repeated for the study of their progenies:

1. Tall ♀ x S. S. Apricot ♂
2. S. S. Apricot ♀ x Tall ♂
3. Gangabondam ♀ x Tall ♂
4. (T x D) F<sub>1</sub> ♀ x (T x D) F<sub>1</sub> ♂
5. Dwarf ♀ x Tall ♂
6. Tall ♀ x Tall ♂

- a) Good yielder x poor yielder
- b) Poor yielder x good yielder
- c) Large nuts x small nuts
- d) Small nuts x large nuts

### 7. *Spicata crosses.*

- a) Spicata ♀ x male tree
- b) Sister tree of  
spicata ♀ x spicata ♂
- c) Selfing of Spicata
- d) Selfing of sister tree of Spicata.

### 8. *World varieties female x Gangabondam male.*

- |                          |                 |
|--------------------------|-----------------|
| a) XI/47 Andaman Giant ♀ | } Gangabondam ♂ |
| b) XI/35 Philippines ♀   |                 |
| c) XI/46 New Guinea ♀    |                 |
| d) XI/74 S. S. Green ♀   |                 |
| e) XI/42 Lac. ordinary ♀ |                 |
| f) XI/60 Fiji ♀          |                 |
| g) XI/66 F. M. S. big ♀  |                 |
| h) XI/73 Andaman dwarf ♀ |                 |



A total number of 12,033 female flowers from 439 inflorescences of 87 trees were pollinated during the season.

In the nursery, a total number of 3,005 hybrid nuts obtained from different crosses made last year were sown towards the end of May.

## VII. Study of optimum parental combinations in Tall x Dwarf crosses.

It has been observed that in the T x D crosses, only certain combinations of Tall and Dwarf give promising progeny. With a view to investigate this aspect in detail and to pitch upon promising parental combinations for the production of quality hybrid seedlings in future, this item of work was undertaken. Seedlings of the following parental combinations raised for this study were planted in Hill Block West on 23-10-1956. The study of their vegetative characters is being continued. Details of leaf production are given below:—

Parental combination of the seedling		No. of leaves produced in the year	No. of leaves produced so far
A 1.	a) I/76 ♀ x IX E/56 ♂	7	25
	b) do.	6	22
	c) do.	5	21
	d) do.	5	23
	Average	5.75	22.75
A 2.	a) I/76 ♀ x IX E/34 ♂	7	25
	b) do.	7	28
	c) do.	7	27
	d) do.	7	27
	Average	7	26.75
3.	a) I/76 ♀ x IX E/23 ♂	8	26
	b) do.	7	24
	Average	7.5	25
B 1.	a) VIII/23 ♀ x XI/71 ♂	7	24
	b) do.	6	23
	c) do.	8	28
	d) do.	8	25
	Average	7.25	25

2.	a)	VIII/23 ♀ x IX E/56 ♂	7	27
	b)	do.	9	28
		Average	8	27.5
3.	a)	VIII/23 ♀ x IX E/23 ♂	8	26
	b)	do.	8	26
	c)	do.	6	23
	d)	do.	7	24
		Average	7.25	24.75

From the observations made it is evident that for female parent I/76, the combination with the male parent IX E/34, and for the female parent VIII/23, the combination with IX E/56 continues to be promising, as far as vegetative characters are concerned. Yield data of the progeny will be followed when they begin to bear. In the meanwhile it is proposed to elaborate this experiment, by choosing first, four palms each of known tall and dwarfs and trying all possible combinations.

### VIII. Study of hybrids and their progenies.

#### a) (*T x D*) hybrids and their progenies

The *T x D* hybrid palms planted in IX Block continue to maintain their high yield. The table provided below gives the yield data of these palms from 1950 onwards.

No. of the		Yield from 1950-1958									
T x D	Age										
hybrid		1950	1951	1952	1953	1954	1955	1956	1957	1958	
1. XI/18	18	69	108	127	83	152	102	162	121	127	
2. XI/19	18	117	53	136	60	133	99	96	100	79	
3. XI/20	18	49	86	75	63	150	62	106	32	97	

The progenies of these hybrids have not so far been studied in sufficient detail. Though open pollinated progenies of these hybrids have been planted in R. S. 39/2-1, in 1952 they continue to be very unsatisfactory, probably due to the poor soil conditions in the plot. Detailed study of the  $F_2$  progeny of these hybrids will be taken up next year.



(b) *Natural cross dwarf palms and their progenies*

While the T x D hybrids are obtained by artificial pollination of the tall with the dwarf, the palms now tentatively designated as 'natural cross dwarfs' are obtained from naturally pollinated nuts of the dwarf and they are now believed to be the products of open pollination of the dwarf with the tall, and hence considered as hybrids. Whether they are really so, or not, however, remains to be verified. This aspect also will be taken up next year.

Nine palms of this group are now grown in Field XI of this Station. They are being regularly observed for their yield performance. Their yield data for the last nine years is given in the table below:-

No. of the palm	Age	Yield from 1950-1958									
		1950	1951	1952	1953	1954	1955	1956	1957	1958	
1. XI/1	19	63	28	118	46	130	117	170	125	157	
2. XI/2	23	84	14	119	44	119	97	111	93	113	
3. XI/3	23	75	56	100	71	83	91	111	86	127	
4. XI/4	23	84	70	107	98	102	120	136	107	165	
5. XI/8	23	40	60	27	90	51	47	96	26	85	
6. XI/15	17	103	67	136	81	121	105	122	135	147	
7. XI/68	19	117	102	119	124	117	92	143	69	122	
8. XI/69	18	49	149	128	93	119	50	87	86	69	
9. XI/76	18	64	113	51	121	63	125	55	141	61	

The above data clearly show that as far as yield characters are concerned, the natural cross dwarfs are, on an average, equally good as the T x D hybrids. Detailed investigations regarding the occurrence of natural crosses in the different colour groups of dwarfs as well as the performance of the  $F_2$  progenies of the palms now available in the Station will be taken up next year.

(c) *Study of seedlings of other hybrid combinations*

The study of the progenies of some of the promising crosses planted in Hill Block West in October 1955 was continued. The details of this study are given below:-



Name of cross and details of parents	No. of seedlings planted	Average No. of leaves produced in the year	Average No. of leaves produced so far
1. Dwarf Green ♀ x Dwarf orange ♂			
a) IX/23 x XI/71	4	8.7	34.5
b) IX E/34 x IX E/56	4	10.5	36.5
2. Dwarf Yellow ♀ x Dwarf Green ♂			
a) XI/62 x IX/23	4	9.7	37.2
b) XI/62 x IX E/34	4	11.7	41.5
3. Dwarf Orange ♀ x Dwarf Green ♂			
IX E/56 x IX E/34	4	10.5	39.2
4. Gangabondam ♀ x Dwarf Orange ♂			
XI/70 x XI/62	4	9.2	34.0
5. Tall ♀ x Gangabondam ♂			
VIII/56 x XI/70	4	8.5	31.5
6. Andaman Giant ♀ x Laccadive small ♂			
(large nuts)                      (small nuts)			
XI/47 x O.C. 27	4	7.5	32.7
7. West Coast Tall			
(for comparison)	21	6.0	25.8

The above data clearly indicate that dwarf crosses in general are more vigorous in growth than the rest of the crosses planted in the field. One seedling of Dwarf Yellow ♀ x Dwarf Green ♂ (XI/62 x IX E/34) flowered during the year under report.

Details of other hybrids planted in Hill Block West in October 1956 are given below:—

1. Tall ♀ x Laccadive ♂			
II/27 x XI/42	2	5.0	19.0
2. Lac. ordinary ♀ x Andaman Dwarf ♂			
XI/42 x XI/73	4	7.5	22.5
3. Andaman Dwarf ♀ x Lac. ordinary ♂			
XI/73 x XI/42	4	6.0	23.3
4. Tall ♀ x Gangabondam ♂			
a) I/24 x XI N.W./2	4	7.5	25.7
b) VIII/56 x XI N.W./1	4	6.2	22.7

5. Gangabondam ♀ x Tall ♂ XI/N.W./1 x VIII/56	3	6.3	23.3
6. Andaman Giant ♀ x Lac. small ♂ XI/47 x XI/27	4	7.0	25.5
7. Lac. small ♀ x Andaman Giant ♂ XI/27 x XI/47	4	6.5	21.5
8. S. S. Green ♀ x Andaman Dwarf ♂ XI/74 x XI/73	10	6.1	22.7
9. Andaman dwarf ♀ x S. S. Green ♂ XI/73 x XI/74	4	6.0	22.2
10. Dwarf Orange ♀ x Gangabondam ♂ IX E/56 x XI N.W./1	3	8.3	26.0
11. Lac. Ordinary ♀ x New Guinea ♂ XI/41 x XI/46	4	7.0	25.2
12. S. S. Apricot ♀ x Gangabondam ♂ XI/62 x XI N.W./1	1	7.0	26.0

During the year under report the following hybrids were planted for study.

a) *East Block*:- (TxD) F<sub>1</sub> ♀ x (TxD) F<sub>1</sub> ♂ 12 seedlings

b) *Hill Block*:-

1. S. S. Apricot ♀ x Gangabondam ♂	2	seedlings
2. S. S. Green ♀ x S. S. Apricot ♂	14	„
3. (T x D) F <sub>1</sub> ♀ x (T x D) F <sub>1</sub> ♂	6	„
4. Spicata ♀ x Tall ♂	4	„
5. Tall ♀ x Spicata ♂	4	„
6. Spicata open pollinated	2	„

From this year's nursery, seedlings of the following combinations have been selected for planting:-

1. Dwarf ♀ x Tall ♂	4	seedlings
2. Dwarf natural cross (obtained by emasculatation of the inflorescence)	5	„
3. S S. Apricot ♀ x Tall ♂	4	„
4. Tall ♀ x S.S. Apricot ♂	2	„
5. Spicata ♀ x Gangabondam ♂	10	„

## IX. Study of inheritance of colour in coconut.

Preliminary studies in this line were taken up last year. Three trees from each of the important colour groups, namely, green, yellow and red were selected. In order to see how they behave with regard to inheritance of colour, when open pollinated, a total of 250 nuts were taken from individual trees of these groups and sown in the nursery. Observations on the colour characters of the progeny showed that the colour of the female parent appears in a good number of the progeny. To investigate the effect of selfing on colour characters of the progeny, two palms each from the above colour groups were selfed, the details of which are given below:—

Colour of tree	Tree number	No. of female flowers selfed
Green	X/16	20
	X/23	15
Red	IV/94	15
	R. S. 40/384	1
Yellow	X/80	15
	IX/145	29

Since in experiments like this, data on a large number of progeny are required, the selfing of the same trees will be continued next year also, with a view to obtain as many selfed seeds as possible from each of the colour groups of trees.

## X. Nursery studies.

### a) *Studies on germination of hybrid nuts*

Regular observations on the germination of hybrid nuts obtained by controlled pollination were taken and recorded. On comparison of the above data with those of open pollinated nuts, it is observed that artificially pollinated nuts germinate earlier than those obtained by open pollination. Detailed measurements of seedlings raised last year have also indicated that seedlings obtained by artificial pollination are superior in all respects to those obtained by open pollination.



b) *Germination studies on exotic nuts*

Observations made on germination of nuts of the different exotic varieties sown in the nursery last year have shown that seednuts of Cochin-China, Philippines, Fiji and S. S. Apricot continue to exhibit the early sprouting character. Germination records of nuts of the exotic varieties collected each month and sown separately are also being maintained to study the performance of the nuts sown in different months of the year.

**XI. Identification of pre-potent high yielders by comparison of a large number of open pollinated progenies.**

This item of work has been taken up following the suggestion of Prof. Harland. The aim of this study is to pick out mother palms from a large number of trees which, in spite of having been indiscriminately pollinated by miscellaneous males, are sufficiently possessed of dominant yield factors to ensure that their offspring is also high yielding. Once a maternal transmitter is identified, it can be continuously used to provide quality seedlings for planting in addition to their use in paired crosses, self pollination and as possible males in extensive crosses with high yielding mother palms.

As a preliminary investigation in this line, 25 high yielding mother palms have been selected. Six hundred and ninety-four nuts collected from them were sown in the nursery with a view to select a few mother palms, which, on the basis of individual performance with regard to the vigour of the progeny are found to be the best. The above nuts are in this year's nursery and are regularly being observed for details of germination and seedling characters. The same experiment will be repeated this year also using the same palms to utilise data of the seedlings for two years in selecting the mother palms. On the basis of such evidence the prepotents will be fixed up for future use in paired crosses as also controlled crosses with dwarf females. This aspect will be taken up only after fixing the prepotents on the basis of data of seedlings for 2 or 3 years.

## XII. Study of anatomy and development of fibre in the husk.

This item of work consists of (a) a detailed study of the origin and development of the fibre in the husk and (b) a comparative study of the quantity and different properties of the fibre, like tensile strength, lignin content, moisture percentage and specific gravity of the different varieties and types of palms.

(a) Female flowers of the West Coast Tall at different stages of development before the opening of the spathe and the buttons after fertilization were fixed in F. A. A. Microtome sections of the female flowers up to the fertilization stage and hand sections of the post fertilization stages were taken and examined. The relative effects of staining the sections with Saffranin and Fast Green, Lactophenol and Cotton Blue and Phloroglucin were studied. Observations of these preparations indicate that the development of fibre initials starts 5-6 months prior to the opening of the spathe. For detailed study of the general structure of individual fibre strands, they were macerated in Potassium hydroxide and stained in Saffranin.

(b) Fibre extracted from 9, 10, 11 and 12 months old nuts of tall, dwarf and (T x D) hybrid trees were studied for their relative properties on the lines indicated above. Comparative study of fibre extracted from individual nuts of different varieties like Philippines, S. S. Apricot, S. S. Green, Laccadive small, Andaman dwarf, Kappadam, Laccadive ordinary, Cochin-China, Andaman Giant, Gangabondam, F. M. S. and New Guinea, with regard to the quantity and relative properties of the fibre is in progress.

## XIII. Coconut survey.

### (a) *Exploratory studies*

The Coconut Survey Assistant made an exploratory survey of the coconut tracts of Tirunelveli, Ramanathapuram and Kanyakumari districts of Madras State and Trivandrum, Kottayam, Quilon, Alleppey, Ernakulam, Trichur and Palghat districts of Kerala State. He was able to obtain seeds of a few exotic varieties growing in a private garden at Kulasekaram in Kanyakumari district,



and 'hooka variety' from Trichur. These nuts have been sown in the nursery for raising seedlings.

(b) *Study on the performance of seedlings supplied to different parties from this Station.*

During his tour, the Coconut Survey Assistant is also contacting different parties to whom seedlings have been supplied from this Station. The performance of these seedlings has been reported to be good. In cases where the seedlings have begun to bear, yield data is also being obtained and recorded. The performance of the (T x D) hybrids has been found to be particularly good. The seedlings of exotic types like Cochin-China, New Guinea and Fiji are also reported to be superior in growth characters than the indigenous types.

#### **Programme of work for 1959-'60.**

- 1 Introduction and study of exotic varieties and interesting indigenous forms of coconut.
  - 2 Comparative study of seedlings of tall, different types of dwarf and their  $F_1$  hybrids.
  - 3 Observations on *Cocos* species other than *C. nucifera* (including chromosome studies).
  - 4 Study of mother palms and their progenies and identification of pre-potent high yielders.
  - 5 Hybridisation and related studies including studies on optimum parental combinations in T x D crosses and evolution of selfed lines for future use in inbred variety crosses.
  - 6 Study of the performance of  $F_1$  hybrids of tall and dwarf and their  $F_2$  progenies.
  - 7 Studies on the inheritance of (a) *spicata* character and (b) colour characters in coconut.
  - 8 Studies on chromosome behaviour of interesting types like *spicata* and *androgena*, twins and delicate palms (for possible haploids) including observations on the cytological basis of pollen sterility.
  - 9 Nursery studies.
  - 10 Coconut survey work.
-



## II. CYTO-ANATOMY

### 1. *Morphology and anatomy of the crown*

These studies which have been in the past confined to the specimens of the tall palms have now been extended to the material from the dwarf, hybrid (between the tall and the dwarf palms) and also the irregularly bearing palms. Accordingly specimens of the dwarf and irregularly bearing palms have now been selected for examination as an initial step and those of the hybrid palms are proposed to be taken up when the examination of the material on hand is completed.

The crowns of the selected palms are being carefully dissected out and necessary observations are being recorded on the nature of the crown, the phyllotaxy, the incidence of abortive spathes, external and internal morphological development of the spathe and its different parts, etc. The material from these specimens is also being preserved for further detailed anatomical examination.

### 2. *Developmental morphology and anatomy of the nut*

The study of the development of the female flower up till the formation of the embryo sac having been completed and reported in the last report, the studies on embryology and development of the nut have now been intensified and studies have now been initiated to study the fertilization and post fertilization stages of development of the female flower. Necessary material for these studies has been fixed, processed and embedded in paraffin and has been taken up for detailed study.

In addition, anatomical studies on the development of fibre in the nut have also been taken up for investigation as recommended by the Expert Reviewing Committee and the results achieved have been reported in detail under the 'Botany and Breeding' section.

### 3. *Cytological studies*

The cytological studies of the available species allied to the coconut, viz., *Cocos plumosa*, *Cocos schizophylla* and *Cocos australis* and also the giant forms of

the coconut, viz., Andaman Giant, Kappadam and New Guinea varieties and varieties of coconut bearing puny nuts like the Laccadive Micro variety have been taken up for investigation. The necessary material for these studies has been fixed after pre-treatment in alcoholic aesculin and 8 hydroxy quinoline and is being studied through smear technique and a part of the material so collected and fixed is being processed and embedded in paraffin for detailed studies.

#### 4. *Pollen studies on the coconut*

The work on the three aspects of studies on coconut pollen under investigation during the preceding year comprising of the estimation of pollen output from three forms of the coconut, viz., Tall, Dwarf and hybrid, determination of the relationship between atmospheric coconut pollen catches and the trends in production of nuts as well as climatic features prevailing during the different months of the year and the determination of the relative share of self pollination, cross pollination due to insects and wind in the present set of nuts in plantations were continued and studies on parthenocarpy were initiated freshly during the year.

##### (a) *Pollen output*

Studies on estimation of relative output of coconut pollen (both total and fertile) from the three kinds of the coconut palm, viz., Tall, Dwarf and the hybrid were undertaken during the three distinct seasons of the year, viz., monsoon, cold and the summer seasons, selecting the typical specimen palms for each of the three kinds. These studies have revealed that, although, the output of pollen in the dwarf palms is generally comparatively higher than that observed in that of the tall or the hybrid palms, due to lower percentage of fertile pollen in the dwarf palms than in the others, the estimated output of fertile or effective pollen has generally been lower (except in the Dwarf Orange) in the dwarf palms. In the case of hybrid palms, due to larger output of pollen and also percentage of fertile pollen, the estimated output of fertile or effective pollen has been



generally higher than that in the other palms as detailed in the data tabulated and presented in the following table.

**TABLE 1**

**Showing the mean pollen output and estimated output of effective pollen.**

Kind	Cultivars	Mean pollen output per inflorescence in million	Mean percentage of fertile pollen	Estimated effective pollen output in millions
Tall	West Coast	99.85	95.68	95.54
	Tall	99.85		
	Laccadive	85.28	95.73	81.64
	Philippine	103.88	95.22	98.91
Dwarf	Green	136.52	67.70	92.42
	Orange	195.60	75.49	147.66
	Yellow	87.10	73.54	64.04
Hybrid	T x D	135.32	95.20	128.82
	T x D	122.64	93.60	114.79
	Gangabondam	136.16	96.40	131.26

These observations, therefore, indicate the superiority of planting hybrid palms to increase the pollen content dispersed in the atmosphere and thus serve as better pollenisers in coconut plantations. The output of pollen in the inflorescences has been observed to be comparatively uniform in the cases of the tall and hybrid palms while it has been observed to be most variable in the case of the dwarf palms, with 147.66 millions in the case of the dwarf orange, 92.42 millions in the dwarf green and 64.04 millions in the dwarf yellow palms. This indicates greater disparities between cultivars of the dwarf palms than those in the other two kinds.



The data collected on the production of male flowers, the number of pollen in the individual flowers and the output of pollen in the inflorescences of the different kinds of palms in the different seasons of the year have been statistically analysed. The results obtained reveal that genetical differences between the three kinds of palms do not bear any significant effects on either the production of male flowers in the inflorescences, production of pollen in each male flower and total pollen production in the three different kinds of palms under observation. In respect of differential effects arising due to the three different seasons of the year, although, no significant effects have been observed on production of number of male flowers, significant effect on production of pollen in individual flower as well as the inflorescence have been observed as is evident from the table following.

TABLE 2

Showing production of male flowers, pollen in an individual flower and inflorescences.

C O D E	Seasons	Production of male flowers			Production of pollen in individual flowers			Pollen production per inflorescence		
		No.	Difference significant or not	Critical difference	No.	Difference significant or not	Critical difference	No. in million	Difference significant or not	Critical difference
A	Monsoon	7804	P < .05 not significant	1849.8	12109	P > .05	5481.70	90.23	P > 0.05	41.89
B	Cold season	6429		1	19654		1	125.05		
C	Summer	7017			22001			152.17		
Coefficient of variability		30.3			Coefficient of variability			32.30		
Coefficient of variability		35.7			Coefficient of variability			35.7		
Conclusion		—			C B A			C B A		

The data has also thus revealed that the pollen production is generally lower in the monsoon season than that in the summer months.

In respect of production of male flowers in the inflorescence and the pollen in the inflorescences, significant effects are noticeable arising due to differences in varieties as is evident from the data presented in the following table.

TABLE 3

Showing the production of male flowers in inflorescences, pollen in individual male flowers and inflorescences in different varieties

C O D E	Variety	Mean production of male flowers per inflorescence			Mean production of pollen per male flower			Mean production of pollen per inflorescence		
		No.	Differ- ence signi- ficant or not	Critical differ- ence	No.	Differ- ence signi- ficant or not	Critical differ- ence	No. in million	Differ- ence signi- ficant or not	Critical differ- ence
A	West Coast Tall	5935	P > 0.05	2853.50	17379	P < .05	10960.8	99.85	P > .05	74.20
B	Laccadive	5632	Signi- ficant		15330	not signi- ficant		85.28	Signi- ficant	
C	Philippines	8410			12891			103.88		
D	Dwarf green	5039			26245			136.52		
E	Dwarf orange	8681			22511			195.60		
F	Dwarf yellow	7890			11678			87.10		
G	T x D (H <sub>1</sub> )	6595			20569			135.32		
H	T x D (H <sub>2</sub> )	6954			17493			122.64		
I	Gangabondam	8615			17196			136.16		
Conclusion		Coefficient of variability 30.3			Coefficient of variability 32.3			Coefficient of variability 35.7		
		EICFHGABD						EDIGHCAFB		



(b) *Pollen catches and their relationship with production and climatic factors*

The data on daily pollen catches from the atmosphere determined with the help of atmospheric slides smeared with Mayer's egg albumen as adhesive and corresponding data on yield and climatic features gathered were tabulated and statistically analysed to find out the possible relationship between daily coconut pollen dispersed in the atmosphere and the different characters. The results of the analysis are embodied in the following table.

TABLE 4

Showing relationship between pollen catches and climatic factors and production.

	Relationship between	Correlation coefficient "r"	Value of correlation coefficient in terms of S.E. "t"	Critical value of "+" for corresponding levels of significance		Significance
				P=0.05	P=.01	
1	Pollen catches and annual production	—	Data not complete			
2	Pollen catches and mean maximum daily temperature	+0.602	+2.384	2.228	3.169	Significant
3	Pollen catches and mean minimum daily temperature	-0.454	+1.175	do.	do.	not significant
4	Pollen catches and difference between mean maximum and minimum daily temperature	+0.858	5.388	do.	do.	Significant

5	Pollen catches and mean morning daily humidity	-0.668	+ 2.838	do.	do.	Significant
6	Pollen catches and total sunshine	+0.818	4.498	do.	do.	Significant
7	Pollen catches and mean daily sunshine	+0.476	1.911	do.	do.	not significant
8	Pollen catches and total rainfall	-0.616	2.473	do.	do.	Significant
9	Pollen catches and mean daily rainfall	-0.611	2.441	do.	do.	Significant
10	Pollen catches and total number of rainy days	-0.798	4.187	do.	do.	Significant
11	Pollen catches and mean wind velocity	+0.143	0.457	do.	do.	not significant

The above results reveal significant relationship between monthly pollen catches and relative mean maximum daily temperature, difference between mean maximum and minimum daily temperature, mean morning daily humidity, total monthly sunshine, total monthly rainfall, mean daily rainfall and the number of rainy days.

(c) *Evaluation of share of different kinds of pollination*

Small scale trials were initiated during the year to evaluate the relative share of the three probable methods of pollination in the set of nuts in the coconut plantations, viz., self pollination, cross pollination through insects and through the agency of wind. The data gathered has revealed that wind plays a small part in the pollination of the coconut as is evident from the data presented in the following statement.

TABLE 5  
Showing percentage set

Treatment	TALL VARIETY					DWARF VARIETY				
	Tree numbers					Tree numbers				
	297/3b	270/3b	238/3b	Total	Mean	24/IX Ext.	23/IX Ext.	37/IX Ext.	Total	Mean
I	10.53	5.26	20.00	35.79	11.25	—	0.00	14.90	14.90	7.45
II	60.00	60.00	14.00	134.00	44.67	28.21	8.60	2.70	39.51	13.17
III*	0.00	0.00	13.21	13.21	4.40	0.00	0.00	13.90	13.90	4.63

Note: I – self and cross pollinated – Secured with inflorescences unbagged and without emasculation.

II – Cross pollinated – Secured with inflorescences unbagged after emasculation.

III – Cross pollinated Secured with bagging in-through wind alone – florescence with close mesh cloth after emasculation.

\* The low setting is apparently due to the obstruction to pollen caused by close mesh cloth used.



The experiment is being repeated on a more elaborate scale.

### *Parthenocarpy*

The work on the parthenocarpy in the coconut has been initiated during the year in accordance with the recommendations of the Expert Reviewing Committee. Preliminary trials undertaken in this direction included the estimation of the extent of natural parthenocarpic set in the coconut and the trials to induce parthenocarpic set through application of synthetic growth promoting substances. The initial small-scale trials conducted to evaluate the extent of natural parthenocarpy in the coconut has helped to reveal its total absence in nature. Trials since then have been conducted to induce parthenocarpic set through application of seven synthetic growth promoting substances, viz., L naphthalene acetic acid, B naphthoxy acetic acid, B indole-3-butyric acid, 2, 4, 5 - trichlorophenoxy acetic acid, 3-indolyl acetic acid, P-chlorophenoxy acetic acid and 3-indolyl propionic acid both in the form of aqueous sprays as well as in lanolin paste. Nineteen concentrations ranging from 5 p. p. m. to 150 p. p. m. in the form of sprays and seven concentrations ranging from 0.15 to 2 per cent in lanolin paste of each of these selected hormones were tried. Applications of hormones in certain concentrations have revealed the incidence of shrinking and shrivelling generally with those of 2, 4, 5 - trichlorophenoxy acetic acid; lagging or arresting in growth with those of 2, 4, 5 - Trichlorophenoxy acetic acid and L naphthalene acetic acid; scorching of nuts with those of P chlorophenoxy acetic acid and barren nut development with those of B naphthoxy acetic acid. Concentrations of these hormones tried in concentrations over 0.25 per cent in lanolin tended to produce abnormal nuts. Of the different hormones under trial, application of B naphthoxy acetic acid has shown the best promise in spray concentrations ranging between 25 p. p. m. and 35 p. p. m. both inclusive and in lanolin paste of 0.20 per cent strength. The other synthetic growth substances that have helped to set nuts parthenocarpically include B indole butyric acid (15 p. p. m. spray), P chlorophenoxy acetic acid (10 p. p. m.

spray) and B indole propionic acid (50 p. p. m. spray and 0.5 per cent in lanolin paste). Applications of 2, 4, 5 - trichlorophenoxy acetic acid have been observed to produce heaviest incidence of abnormalities in production of nuts.

## 5. Studies on shedding of buttons

The three aspects of pollen under investigation during the year included estimation of long-term effects in trees sprayed with hormones continuously, conduct of field trials to evaluate the long-term effects on trees sprayed with hormones continuously in conjunction with and without manuring, trial of other synthetic growth promoting substances, viz., gibberellic acid, L naphthalene acetic acid, B naphthoxy acetic acid, P chlorophenoxy acetic acid on control of shedding of buttons.

### (a) *Estimation of long-term effects of hormone spraying*

Observations recorded on coconut trees sprayed with hormones continuously without application of regular annual manuring of sprayed trees have shown a general exhausting effect on trees due to heavy production of nuts in sprayed bunches resulting in a marked reduction in the production of female flowers in years following spraying as seen from the following table.

**TABLE 6**  
**Showing yield data on trees continuously**  
**sprayed with hormones**

Tree No.	Mean annual production of female flowers		Mean production of female flowers per spadix	
	Prior to spray	After spray	Prior to spray	After spray
1. 4/VII	211	188	20.3	17.6
2. 10/VII	320	247	22.2	13.6
3. 11/VII	237	177	27.0	13.7



4.	14/VII	243	180	29.0	21.7
5.	15/VII	173	135	21.3	18.4
6.	20/VII	289	210	28.8	20.3
7.	53 VII	230	187	20.9	15.0
8.	83/VII	372	273	32.1	22.2
9.	92/VII	230	188	21.3	17.0
10.	94 VII	279	255	22.3	18.6

(b) *Field trials to evaluate the long-term effects of spraying*

Field trials have, therefore, been laid out in randomised replicated design with eighteen trees in a plot, four replications and three treatments, viz., plots with trees receiving regular applications of manure combined with spraying with hormone mixture, plots with trees receiving regular applications of manure without spraying and plots with trees not receiving annual manuring but receiving regular spraying of hormones to enable the correct evaluation of long and short-term effects of spraying of hormones on trees. Schedule of spraying operations were attended to and all the trees covered under the experiment, except the plot receiving no manure and sprayed with hormones, have been manured with 4½ lbs. of Ammonium sulphate, 3 lbs. of Muriate of potash and 3 lbs. of superphosphate per tree for the first time after the lapse of over ten years. Although, at present, the production of female flowers on bunches from these trees, covered under the trial has been very low, not permitting correct evaluation of the effect of hormone sprays on increasing setting of nuts, yet the spraying of hormones on trees has even in the first year of trial helped to secure an increase of about two nuts or 153.82 gms. of copra per bunch over trees receiving similar manurial treatment without spray of hormone mixture and an increase of two nuts and 304.47 gms. of copra per bunch over trees receiving spray of hormone mixtures without annual application of manures as seen from the following table.



TABLE 7

Showing yield of nuts and copra per bunch

	Spray and Manure		No spray and Manure		Spray and No manure	
	No. of nuts	Copra	No. of nuts	Copra	No. of nuts	Copra
Block I	7.35	940.29	4.80	739.92	4.66	582.08
Block II	6.85	885.38	4.12	682.80	—	—
Block III	7.68	946.90	5.52	788.41	—	—
Block IV	5.60	773.64	4.67	729.80	—	—
Total	27.48	3546.21	19.11	2940.93	4.66	582.08
Mean	6.87	886.55	4.78	732.73	4.66	582.08

These results even in the very first year of experimentation have, therefore, helped to indicate the imperative necessity of manuring trees in the event of undertaking hormone spraying on them in order to improve the size of nuts and copra content of nuts. The observations on the effect of manuring on production of female flowers are being periodically recorded.

(c) *Trial of other synthetic growth promoting substances*

Small-scale observational trials were undertaken to estimate the effect of sprays of Gibberellic acid in concentrations ranging from 5 p. p. m. to 40 p. p. m. in controlling shedding of buttons. Observations recorded on the effect of these sprays have revealed that sprays of these in concentrations ranging from 10-40 p. p. m. have generally recorded an appreciable increase in setting of nuts than those in the control bunches left without spraying as is observable from the following table.

**TABLE 8**  
**Showing the percentage setting of nuts**

Treatment		Tree No. 51/VIII	Tree No. 49/VIII	Tree No. 44 VIII	Total	Mean
1	Control	38.89	66.67	7.74	112.70	34.23
2	Gibberellic acid 5 p. p. m.	25.00	16.67	40.00	81.67	27.22
3	Gibberellic acid 10 p. p. m.	68.18*	100.00*	88.89*	256.07	85.36
4	Gibberellic acid 15 p. p. m.	20.00	61.90	50.00	131.90	43.97
5	Gibberellic acid 20 p. p. m.	42.85	20.00	58.33	121.18	40.39
6	Gibberellic acid 25 p. p. m.	100.00	90.00	26.67	216.67	72.22
7	Gibberellic acid 30 p. p. m.	54.54	66.67	43.48	154.69	51.56
8	Gibberellic acid 40 p. p. m.	28.00	54.54*	61.54*	144.08	48.03

\* Very high percentage set is apparently due to poor number of female flowers on the bunch sprayed and consequent heavy set.

The periodical observations recorded on the development of nuts from bunches sprayed with Gibberellic acid have indicated generally an appreciable decrease in the incidence of abnormal nuts. The trial of Gibberellic acid on shedding of buttons has, therefore, indicated some promise, although, the correct assessment of its effect could only be made after conduct of large-scale trials intended to be undertaken during the following year.

Trials were also conducted to evaluate the fortifying influence of Gibberellic acid in concentrations ranging from 5 p. p. m. to 30 p. p. m. on 2, 4-Dichlorophenoxy acetic acid. Observations on setting of nuts as well as development of nuts from bunches sprayed with the different combinations of these two acids is being periodically recorded. The observations recorded so far presented in the following table reveal that there has not been any adverse effect on setting of nuts resulting from the mixture of two acids.



**TABLE 9**  
**Showing percentage set of nuts**

Treatment		Mean of first re- plicate	Mean of second replicate	Mean of third replicate	Total	Mean
1	Control	43.39	54.40	34.58	132.34	44.09
2	2,4-D 30 p.p.m.	52.37	55.25	62.86	170.48	56.83
3	2,4-D 30 p.p.m.+ 5 p.p.m. Gibber- ellic acid	53.43	42.84	57.78	154.05	51.35
4	2,4-D 30 p.p.m.+ 10 p.p.m. Gibber- ellic acid	57.16	67.70	68.15	183.01	61.00
5	2,4-D 30 p.p.m.+ 15 p.p.m. Gibber- ellic acid	67.42	60.82	53.16	187.40	60.47
6	2,4-D 30 p.p.m.+ 20 p.p.m. Gibber- ellic acid	64.75	53.03	41.45	169.23	56.46
7	2,4-D 30 p.p.m.+ 25 p.p.m. Gibber- ellic acid	61.38	56.21	48.11	165.70	55.23
8	2,4-D 30 p.p.m.+ 30 p.p.m. Gibber- ellic acid	63.90	55.18	58.09	177.17	59.06

The effect of these sprays on occurrence of abnormalities and barren nuts is yet to be correctly estimated when the nuts are mature.

Sprays of other synthetic growth promoting substances under observational trials in the control of shedding of buttons included L naphthalene acetic acid, B naphthoxy acetic acid and P chlorophenoxy acetic acid in higher concentrations ranging from 50-200 p.p.m. Periodical observations on setting and development of nuts from bunches sprayed with these different hormone sprays have been recorded. These observations recorded so far have revealed that while spraying of L naphthalene



acetic acid and P chlorophenoxy acetic acid resulted in incidence of abnormal nuts, sprays of B naphthoxy acetic acid are generally free from them.

**6. Study of the problem of occurrence of barren nuts.**

Trials conducted in the past years to estimate the effect of emasculation and spraying cow's urine on inflorescences against control of barren nut production having indicated variable and undependable results in the past four-year period of the trial, these trials were discontinued.

Embryological studies have now been taken up for detailed investigation to find out the differences in the development of the embryo in the normal and barren nut to help to secure an insight into the cause of barren nut production. Necessary material in connection with these studies have been collected, processed and embedded in wax for further study.

Trials were initiated to evaluate the effects of three synthetic growth substances, viz., L naphthalene acetic acid, B naphthoxy acetic acid and P chlorophenoxy acetic acid in lanolin medium in the control of barren nut production. Preliminary trials conducted have helped to determine the optimum strength of application and the method of application. The strength of hormones higher than 0.2 per cent in lanolin paste has been found to produce all sorts of abnormalities, viz., shrivelling, scorching, malformation, etc., of the buttons particularly when applied after cutting away edges of the perianth. Least signs of abnormalities have been observed when hormone pastes were applied after scratching the perianth lobes. On the basis of the standardisation of the concentration of the hormone paste and the method of application, regular observation trials are being conducted with these growth regulators on six trees producing largest percentage of barren nuts.

**7. Floral Biological studies of palms other than the coconut.**

Studies on floral biology of palms other than the

coconut have now been discontinued in accordance with the recommendations of the Expert Reviewing Committee.

### 8. Vegetative propagation.

Trials were initiated to induce meristematic activity in coconut stems leading to rooting and suckering through application of growth promoting substances. For this purpose stems of coconut trees selected at random were girdled initially by stripping off about  $1\frac{1}{2}$ " width and a quarter to half an inch depth of the bark about a foot above the ground level. After application of hormones to this portion they were covered over by heaping soil round this portion in the form of a mound kept always moist by irrigating these mounds frequently. In respect of trials carried out with the object of inducing rooting, three hormones, viz., L naphthalene acetic acid, B indole butyric acid and B indole acetic acid in twenty-seven different concentrations varying from 0.01 to 10 per cent in lanolin paste were tried. Of these fifty-four formulations tried, only four have shown initiation and growth of roots as detailed in the following table. In the trials to induce suckering in trees, mixtures of two available purines, viz., Adenine and Adenosine in two different selected concentrations (40 and 80 p. p. m.) in the form of spray and four different concentrations in lanolin paste and two selected auxins, viz., L naphthalene acetic acid and B indole butyric acid in 30 concentrations in the form of aqueous sprays and three concentrations in lanolin medium and in different combinations of the selected concentrations of purines and auxins both in the form of aqueous sprays and lanolin paste have been tried. Periodical observations were recorded on initiations and growth of roots of the so treated portions. Although it is a little early to expect the result of applications and none of the treatments have shown inducement of suckers, however, distinct rooting has been observed in the case of four of the three hundred and six treatments as detailed in the following table.



TABLE 10

Date of treatment	Treatment	Method of application	Total No. of roots on suckers induced by hormone application	Remarks
1-8-58	2 mgms Indole acetic acid in 10 gms. of Lanolin	Paste	4 roots (23-4-59)	
„	100 mgms Indole acetic acid in 10 gms. of Lanolin	„	14 roots (23-4-59)	This palm has already shown indication of rooting
„	5 gms. of L naphthalene acetic acid in 10 gms. of Lanolin.	„	1 root (23-4-59)	
„	20 cc. of 80 ppm. Adenosin + 5 cc. of 20 ppm. naphthalene acetic acid + 15 cc. of water.	Sprays	6 roots (24-3-59)	Old palm
„	20 cc. of 80 ppm. Adenine + 0.9 cc. of 20 ppm. Indole butyric acid + 19.1 cc. of water.	Sprays	2 roots (31-8-59)	Old palm
„	20 cc. of 80 ppm. Adenine + 0.4 cc. of 20 ppm. Indole butyric acid + 19.6 cc. of water.	Sprays	1 root (31-8-59)	
„	20 cc. of 40 ppm. Adenosin + 11 cc. of 20 ppm. Indole butyric acid + 9 cc. of water.	Sprays	1 root (31-8-59)	Middle aged palm



- „ 20 cc. of 80 ppm.  
Adenine + 7 cc. of  
20 ppm. L naphth-  
alene acetic acid + Sprays 1 root  
19.3 cc. of water. (31-8-59)
- „ 350 mgms of L  
naphthalene acetic  
acid in 10 gms. of Paste 4 roots Middle  
Lanolin. (31-8-59) aged palm

### Programme of work for 1959-60.

1. Studies on the morphology and anatomy of the crown and its parts.
2. Studies on developmental morphology and anatomy of the nut.
3. Cytological study of the varieties of the coconut palm.
4. Studies on the coconut pollen.
5. Studies on shedding of buttons.
6. Studies on production of barren nuts.
7. Vegetative propagation in the coconut.

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## III. AGRONOMY

### 1. Manurial Experiments

#### (i) *NPK manurial Experiment*

This experiment was started in 1953 with the object of studying the response of adult coconut palms growing in loamy soils to all combinations of N, P and K each at three levels with and without a green manure crop. All the three nutrients were applied at 0, 0.75 lb. and 1.50 lb. per tree, per year. Nitrogen was applied as ammonium sulphate, phosphoric acid as superphosphate (ordinary) and potash as muriate of potash. *Crotalaria striata* was grown as green manure and incorporated in these plots which were to receive green manure. A  $3^1 \times 2$  confounded design in 6-plot blocks replicated twice has been adopted.

No significant differences in yield among the treatments were observed in 1954. In 1955, 1956 and 1957 a definite response to nitrogen was obtained. There was, however, no significant difference in response between the single and double doses. Phosphoric acid and potash did not show any marked response. Studies carried out on the quality of the nut showed some deterioration where nitrogen had been applied.

The experiment had its fifth year of run during the period under report. As in last year the effect of the different treatments on yield of nuts, out-turn of copra, nut and copra characters, incidence of foliar yellowing and leaf spot disease, etc., were studied and the results are discussed below.

(a) *Yield of nuts*

The yield data were subjected to statistical analysis by the covariance method using pre-treatment yield as the concomitant factor. Significant differences were observed among the main effects of nitrogen and potash. There was no response to phosphoric acid. None of the interactions proved significant though there was some strong indication of a nitrogen x green manuring interaction. The data in respect of main effects are summarised. (See table on page 38).

The response to nitrogen observed in previous years was continued to be maintained. Single dose of nitrogen proved better than double dose and both were superior to 'no nitrogen'. Response to potash, seen for the first time, showed that the double dose while on a par with the single dose had given better yields than 'no potash' treatment. Single dose was only on a par with 'no potash'. Green manuring on the whole had only little effect. Lack of nitrogen appeared to reduce yields more than lack of phosphoric acid or potash.

Main effect	Mean yield of nuts (adjusted during '58)	Mean yield as percentage on 'no nutrient'	Whether differences significant or not	Critical difference (P=0.05) (No. of nuts)	Conclusion
N <sub>0</sub>	49.8	100	Yes	3.28	N <sub>1</sub> , N <sub>2</sub> , N <sub>0</sub>
N <sub>1</sub>	57.9	116.2	P < 0.01		
N <sub>2</sub>	54.2	108.8			

P <sub>0</sub>	53.1	100	No		
P <sub>1</sub>	54.4	102.7	P > 0.05	—	—
P <sub>2</sub>	54.4	102.7			
K <sub>0</sub>	51.5	100	Yes		
K <sub>1</sub>	53.8	104.5	P < 0.01	3.27	$\overline{K_2, K_1 K_0}$
K <sub>2</sub>	56.6	109.9			
G <sub>0</sub>	53.2	100	No		
G <sub>1</sub>	54.7	102.8	P > 0.05		

(b) *Quality of the nut* The results of the studies on the nut and copra characters have been summarised below, for the main effects only. The percentage by which the values had increased or decreased (-) with increase in the dosage of nutrients has been indicated within brackets.

Main effect	Mean wt. of nut (gm.)		Mean volume of nut (c.cm.)		Mean copra content per nut (gm)
	Unhusked	Husked	Unhusked	Husked	
N <sub>0</sub>	891-	501-	2458-	563-	177-
N <sub>1</sub>	821	442	2268	517	164
	(-8.1)	(-11.8)	(-7.7)	(-8.2)	(-7.4)
N <sub>2</sub>	783	423	2150	494	158
	(-12.1)	(-15.6)	(-12.5)	(-12.3)	(-10.7)
P <sub>0</sub>	836-	451-	2298-	516-	165-
P <sub>1</sub>	818	453	2282	527	167
	(-2.1)	(0.4)	(-0.7)	(2.1)	(1.2)
P <sub>2</sub>	841	463	2295	531	167
	(0.6)	(2.7)	(-0.1)	(2.9)	(1.2)
K <sub>0</sub>	787-	438-	2095-	514-	160-
K <sub>1</sub>	848	463	2348	527	168
	(7.7)	(5.7)	(12.0)	(2.5)	(5.0)
K <sub>2</sub>	859	465	2431	533	171
	(9.1)	(6.2)	(16.1)	(3.7)	(6.9)
G <sub>0</sub>	820-	446-	2251-	513-	165-
G <sub>1</sub>	844	465	2333	536	168
	(2.9)	(4.2)	(3.6)	(4.5)	(1.8)



There is a progressive deterioration in all the nut characters with increase in the quantity of nitrogen applied. Phosphoric acid has given erratic results and its effect is only little. There has been progressive improvement in all characters in the case of potash; maximum improvement is seen in the volume of un-husked nuts. The effect of green manuring, though relatively small, was on the whole on the favourable side.

(c) *Out-turn of copra* Since copra is the commercially important product of the coconut palm, the overall effect of treatments on the total out-turn of copra per palm was worked out and the results are given below:—

### Main effects

	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	K <sub>0</sub>	K <sub>1</sub>	K <sub>2</sub>	G <sub>0</sub>	G <sub>1</sub>
Copra out-turn per tree (in kgm)	8.81	9.50	8.57	8.76	8.98	8.98	8.24	9.04	9.68	8.78	9.19
Percentage increase or decrease (-) over 'no nutrient'	100	107.8	97.3	100	102.5	102.5	100	109.7	117.5	100	104.7

Among the main effects of nitrogen only the single dose has given better out-turn of copra than 'no nitrogen'. The double dose has depressed copra out-turn. Phosphoric acid had only negligible effect. Potash tended to increase the copra yield with increase in the dose of potash applied. Green manure also had only relatively little effect on copra out-turn.

(d) *Incidence of foliar yellowing* As in last year the incidence of foliar yellowing was studied in relation to the manurial treatments. The data are summarised below for the main effects.

### Main effects

	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	K <sub>0</sub>	K <sub>1</sub>	K <sub>2</sub>	G <sub>0</sub>	G <sub>1</sub>
Percentage of palms showing foliar yellowing	1.4	3.8	6.9	4.3	3.8	3.9	8.0	3.0	1.5		

There is a progressive increase in incidence of foliar yellowing with increase in the dose of nitrogen applied. In the case of potash, there has been a definite decrease with increase in the quantity of potash. Phosphoric acid did not have much effect.

(e) *Incidence of leaf spot* The data in respect of leaf spot infection are summarised below for the main effects.

### Main effects

	N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	K <sub>0</sub>	K <sub>1</sub>	K <sub>2</sub>	G <sub>0</sub>	G <sub>1</sub>
Percentage of leaf area affected by leaf spot	0.11	0.12	0.09	0.13	0.11	0.11	0.13	0.12	0.12	0.12	0.12

Leaf spot attack was very mild this year when compared to the previous year and there was no marked difference among the main effects of the different nutrients.

(f) *Effect of treatment in relation to the bearing capacity of the palm* In order to determine how trees of different bearing capacities in the pre-treatment period have responded to manure application, the mean yields of the trees classified into groups on the basis of pre-treatment yields were compared with the yields recorded by the same groups of trees in 1958. The data are summarised below:—



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	0-	10-	20-	30-	40-	50-	60-	70-	80 &
Yield groups	9.9	19.9	29.9	39.9	49.9	59.9	69.9	79.9	above
Mean yield during pre-treatment period	4.5	15.1	24.9	35.0	44.4	54.5	64.3	74.2	91.6
Mean yield in 1958	24.2	30.5	36.3	45.7	52.4	61.4	66.9	76.8	93.3
Difference in yields	19.7	15.4	11.4	10.7	8.0	6.9	2.6	2.6	1.7
Difference as percentage over the pre-treatment yield	437.8	101.9	45.7	30.5	18.0	12.7	4.0	3.5	1.9

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There has been an all-round increase in 1958 in the yield of nuts in the palms of all yield groups when compared to the yield in the pre-treatment period. The increase, both in terms of absolute quantity and as percentage over the pre-treatment yields, showed a decreasing trend with increase in the yielding capacity of the trees during the pre-treatment period. It may be noted, however, that in spite of the differential responses there has been no change in the ranking of the yield groups in 1958 as compared to the pre-treatment period.

The experiment is being continued.

## (ii) *Trial of nitrogenous fertilisers*

### (a) *Chilean nitrate vs. Ammonium sulphate*

This observational trial was started in 1953 with the object of determining the relative merits of chilean nitrate and ammonium sulphate as a source of nitrogen for the coconut palm. It was being claimed that chilean nitrate is better than ammonium sulphate in that the nitrogen in it is in the easily available nitrate form and that the large quantity of sodium contained in it will to some extent obviate the necessity for potash. Both the forms



of nitrogen were applied alone and in combination with phosphoric acid and potash. Nitrogen was supplied at 1 lb. per tree, phosphoric acid at 0.5 lb. as superphosphate (ordinary) and potash at 1.0 lb. as muriate of potash.

In 1954 there was no marked difference in yields between the two forms of nitrogen adopted. In 1955, 1956 and 1957 better yields were obtained with chilean nitrate than with ammonium sulphate.

During the year under report, the trial had its fifth year of working. The yield data for 1958 are summarised below:—

	Mean yield of nuts per tree (adjusted)			
	alone	with P	with P+K	Mean
Chilean Nitrate	57.4	56.1	80.6	64.7
Ammonium Sulphate	46.2	53.2	59.3	52.9
Mean	51.8	54.7	70.0	

It is seen that Chilean nitrate has given on an average 11.8 nuts more per tree or 22 per cent more than ammonium sulphate. The difference is particularly marked when supplemented with phosphoric acid and potash. In the absence of potash application, there has been a great reduction in yield in the case of chilean nitrate showing thereby that sodium contained in the manure has not been able to meet the needs for potash of the palm. The results also showed potash to be very necessary to get maximum yields while phosphoric acid is not so important.

The experiment is being repeated for one more year.

(b) *Trial of other nitrogenous fertilisers*

This trial was commenced in 1956 with the object of assessing the relative merits of different nitrogenous fertilisers such as ammonium sulphate, ammonium sulphate nitrate, ammonium chloride, calcium ammonium nitrate, calcium cyanamide, urea and groundnut cake as a source of nitrogen for the coconut palm. The nitrogenous manures were applied at rates sufficient to give 1.0 lb. of nitrogen per palm and supplemented with phosphoric

acid and potash at 0.5 lb. and 1.0 lb. respectively as superphosphate (ordinary) and muriate of potash. A 9 x 6 completely randomised design with single tree plots has been adopted.

In 1957 there was no significant difference in yield among the different forms of nitrogen used.

The trial had its second year of working during the year under report. The results of analysis of the yield data are summarised below:—

Treatment	Mean yield of nuts per tree in 1958 (adjusted)
1 Ammonium sulphate + P + K	75.2
2 Ammonium sulphate nitrate + P + K	65.4
3 Ammonium chloride + P + K	61.8
4 Calcium ammonium nitrate + P + K	79.3
5 Calcium cyanamide + P + K	70.6
6 Urea + P + K	64.1
7 Groundnut cake + P + K	59.9
8 P + K	82.0
9 Control	58.8
General mean	68.6
Standard error per tree per plot (nuts)	22.93
Coefficient of variation (%)	35.5
Improvement in precision by adopting covariance analysis (%)	78.71

Whether differences significant or not No;  $P > 0.05$   
 There was no significant difference among the different treatments though the manured trees have given increased yields over the control.

The trial will be continued.

### (iii) Manuring-cum-irrigation experiment

This observational trial was started in 1956 to study the combined effects of manuring and irrigation on the coconut palms. Manuring schedule adopted consists of 1.0 lb. of nitrogen as ammonium sulphate, 0.5 lb. of phosphoric acid as superphosphate (ordinary) and 1.0 lb. of



potash as muriate of potash. This was applied as one dose in August-September or in April with irrigation or in two split doses, one in August-September and the other in April. Irrigation was given during summer by pot watering with 10 gallons of water twice a week. The layout adopted was 6 x 5 randomised block design with single tree plots.

In 1957 the yield data did not show any significant differences in yield among the different treatments.

The yield data obtained during the year under report are summarised below:—

<i>Treatment</i>	<i>Mean yield of nuts per tree during 1958</i>
1) Manuring with full dose in August-September	47.9
2) Manuring with $\frac{1}{2}$ the dose in August-September and the other half in April with irrigation	42.5
3) Manuring with full dose in April with irrigation	49.8
4) Manuring with full dose in August-September and irrigation in summer	32.4
5) Irrigation alone in summer	62.2
6) No manuring and no irrigation	27.7
General mean	43.8
Standard error per plot	21.27
Coefficient of variation (%)	48.6
Improvement in precision by } adopting covariance analysis (%)	122.1
Whether differences significant or not	Yes; $P < 0.01$
Critical difference ( $P = 0.05$ )	+ 28.8
Conclusion	(5), (3), (1), (2), (4), (6)

There were significant differences in yield among the treatments. Palms which were irrigated in summer



gave better yields than the control trees and those which received manuring in August–September in addition to irrigation.

Observations are being continued.

(iv) *Method of application of fertilisers*

This experiment was started in 1957 to investigate as to how the response of the palms to manuring is influenced by the method of application adopted such as broadcasting and covering, basin application and application in mammotty holes. The manures applied consisted of 1.0 lb. of nitrogen, 0.5 lb. of phosphoric acid and 1.0 lb. of potash per tree per year. The design of layout adopted was 7 x 4 randomised and replicated one.

The year under report was the first year of the experiment. The yields obtained are summarised below:—

<i>Treatment</i>	<i>Mean yield of nuts per tree in 1958 (adjusted)</i>
1) Broadcasting and ploughing	56.9
2) Ploughing alone	61.4
3) Application in basins	55.5
4) Basins alone	54.4
5) Application in mammotty holes	58.4
6) Mammotty holes alone	60.1
7) Control (no manuring)	57.2
	<hr/>
General mean	57.8

Standard error per plot	5.1
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Coefficient of variation (%)	8.8
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Improvement in precision by adopting covariance analysis (%)	} 129.31

Whether differences significant or not	No; $P > 0.05$
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There was no significant difference in yield among the different methods of application.

The experiment will be continued.

(v) *Manurial experiment on seedlings in sandy soil*

This new experiment was started during the year to study how newly planted seedlings in sandy soil respond

to major nutrients N, P and K applied singly and in combination at one level, with and without basal application of green leaves. A schedule of manuring with provision for increasing the dosage according to the age of the seedling has been drawn up.

The seedlings under this experiment were first planted in the sandy soil area in 1957 without applying any fertiliser. Fertilisers were applied for the first time in 1958 after the seedlings have established satisfactorily. A randomised block design 8 x 8 with single seedling plot has been used. Four of the eight replications selected at random received green leaves as basal dressing.

Production of new leaves is taken as indicating the response to manuring. The data regarding the production of new leaves during the period between the first manuring and after a period of 8 months are summarised below. Since the period covered is short, the data can at best indicate only trends

Mean no. of new leaves produced

	n	p	np	k	nk	pk	npk	Control
G <sub>1</sub>	1.0	2.4	0.8	1.5	1.7	-0.1	1.1	2.0
G <sub>2</sub>	1.3	0.7	1.5	-0.7	1.7	-0.2	1.2	0.1
G <sub>1</sub> -G <sub>2</sub>	-0.3	1.7	-0.7	2.2	—	0.1	-0.1	1.9

There is indication of some interaction between green manuring and the other fertilisers. Where green manuring has been done nitrogen fertiliser has shown only little response. In its absence, nitrogen has shown beneficial results. No appreciable response to potash or phosphorus is seen at this stage.

The experiment is being continued.

## 2. Cultural experiments

(a) *Effect of 'cultivation and manuring' vs. 'cultivation alone without manuring' and 'no manuring and no cultivation'*

The three observation plots under this trial were under the above treatments since 1933. The regularly



cultivated and manured plot received the general dose of manure and cultivation by way of two or three ploughings with iron plough and working of junior hoe once or twice according to necessity. The regularly cultivated plot received identical cultivation treatment as the previous plot, but no manuring. The 'no manuring and no cultivation plot' continued in a neglected condition.

Regular cultivation and manuring helped in stepping up and maintaining the yield at a high level. Regular cultivation alone was also very beneficial in increasing production.

The yield data obtained during 1958 from the above plots are given below:—

	<i>Mean yield of nuts per tree</i>
Regularly cultivated and manured	59.5
Regularly cultivated but not manured	45.9
Not cultivated or manured	21.7

As in previous years the highest yield has been obtained under regular cultivation and manuring and lowest under neglect. Regular cultivation alone has also given high yields.

On working out the economics, regular cultivation and manuring has given this year per tree a net additional profit of Rs. 5.46, and regular cultivation alone, Rs. 4.54, which should be considered as very substantial.

Observations will be continued in the permanent demonstration plots.

#### (ii) *Trial of intercultural practices*

This trial was started in 1952 with the object of determining the most effective and economic cultural practices to be adopted in loamy soils. A 5 x 4 randomised and replicated block design has been adopted.

Significant differences among the different treatments were not observed in any of the previous years but 'piling of mounds' treatment gave consistently increased yields over the others.



The yields obtained during the year under report are summarised below:—

		Mean yield of nuts during 1958
1	Ploughing twice with iron plough	33.6
2	Digging with mammotty once	42.8
3	Piling mounds and levelling	42.1
4	Forming basins and covering	41.3
5	Control	36.1
General mean		39.2

Standard error per tree per plot 6.31

Coefficient of variation (%) 9.71

Whether differences significant or not No;  $P > 0.05$

The differences did not come up to the level of significance this year also. However, the yields obtained for the treatments 'Digging with mammotty' and 'piling mounds and levelling' are higher than those obtained in other cases.

### Moisture studies

The soil moisture percentages under the differently treated plots were determined both during the monsoon season (August) and in summer (May). It was slightly more in the 'piling mounds and levelling' treatment as can be seen from the data furnished below:—

	August			May		
	0-12"	12"-24"	24"-36"	0-12"	12"-24"	24"-36"
Percentage of moisture						
Ploughing	11.0	10.4	10.6	6.8	9.2	7.6
Digging once	10.5	11.5	10.2	7.5	9.5	8.4
Piling mounds	12.3	12.0	11.8	8.2	10.3	9.8
Forming basins	10.8	13.0	12.4	6.5	8.7	9.9
Control	11.4	11.4	12.9	7.5	10.9	9.6

In the 'piling up and levelling treatment' attempts were made as in last year to determine the soil moisture under

the mounds and in the intervening area. The data summarised below will show that there is more of soil moisture at all depths under the mounds.

	Percentage of moisture		
	0-12"	12"-24"	24"-36"
Below the mounds	8.0	9.2	10.0
In between the mounds	7.1	8.9	9.3

Since it is proposed to wind up the experiment in the present form from the next year onwards, the entire data obtained over the past six years have been analysed and the economics worked out. The following are the results.

Treatment	Mean yield per tree over the 6-year period	Increase or decrease (-) over control	Value of additional nuts produced @ 20 nP. per nut	Cost of cultivation per tree (taking 60 trees to an acre)	Profit or loss (-)
Ploughing twice with iron plough	39.5	-0.7	Rs. nP. -0.14	0.22	Rs. nP. -0.36
Digging with mamotty once	43.0	2.8	0.56	0.23	0.33
Piling mounds and levelling	45.5	5.3	1.06	0.41	0.65
Forming basins and covering	40.6	0.4	0.08	0.34	-0.26
Control	40.2	—	—	—	—

It is seen that 'digging with mamotty once' and 'piling mounds and levelling' treatments have given additional profits to the extent of Rs. 19.8 and Rs. 39 respectively per acre. 'Ploughing' and 'forming basins' treatments have resulted in loss. Since the trees are fairly high yielding even in the absence of any treatment, the cultivation treatments have not been able to induce much of improvement in yields.



The experiment will be continued, but each of the experimental plots will be sub-divided into two and one portion selected at random will be manured as per schedule just to find out what is the further improvement that can be brought about by manuring.

### 3. *Yield studies*

Detailed flowering and fruiting notes were recorded for all the bearing trees in the Station. During the calendar year 1958 the total yield worked out to 2,90,383 which is 7.3 per cent more than the yield obtained during the previous year.

The month of April had the maximum share in total yield accounting for 12.1 per cent. Maximum number of trees are also found to yield nuts during this month.

### 4. *Nursery studies*

#### (i) *1958 Bulk nursery*

In the bulk nursery raised during the year seednuts of the tall variety numbering 19,450 nuts from the Station, 285 nuts from Chowghat centre and 5,750 nuts from Badagara centre were planted in the nursery. The percentage of germination was satisfactory. Kasaragod nuts showed a germination of 95 per cent, Chowghat nuts 96.5 per cent and Badagara nuts 92 per cent.

Due to the partial failure of the North-east monsoon rains the percentage of dead sprouts in the earlier stages was slightly more. It was 11.8 per cent in the case of Kasaragod nuts, 10.1 per cent in the case of Badagara nuts and 4.9 in Chowghat nuts. Two new innovations introduced during the year, viz., overhead shading and irrigation by means of hose pipes proved very beneficial for the vigorous and healthy growth of the seedlings.

#### (ii) *Maturity of nuts in relation to germination, death of sprouts and growth of seedlings*

This investigation was first done last year and there was indication to show that immaturity of nuts can result in large-scale non-germination of nuts and death of young sprouts in the nursery. The study was repeated during the year in more detail with larger



numbers of nuts. Data on ungerminated nuts and dead sprouts are summarised below:-

		Ungerminated nuts (%)	Dead sprouts (%)
12	months old nuts	5	6
11	" "	7	11
10	" "	7	7
9	" "	14	12

The differences among the nuts of different age groups were not so great as observed last year. Still there is indication that immaturity of nuts may contribute to non-germination of seednuts and death of young sprouts.

The seedlings selected at random from those growing out of the nuts of different maturity were also studied for vegetative characters relating to growth, viz., height of seedlings, girth at collar and number of leaves. The data are summarised below:-

	Height of seedlings (cm)	Girth at collar (cm)	No. of leaves
12 months	104	10.8	5.9
11 "	91	10.0	5.4
10 "	97	10.3	5.5
9 "	72	9.7	4.9

Seedlings from immature nuts are inferior to others in all the characters particularly in the height of seedlings and number of leaves.

This study will be discontinued.

(iii) *Use of seedling pots to provide a source of moisture during drought periods*

This is a repetition of the study carried out last year which had shown that providing three porous mud

pots round the base of the seedlings will help to lessen the effects of drought during summer.

In the repeated experiment also, one, two or three pots were used as source of moisture. Water was replenished in these pots every week. Each of these had a control which was watered once a week by the usual method of pot watering. As mentioned last year the capacity of each pot was about seven litres.

The condition of the seedlings at the termination of the observation period, i. e. after about 4 months was as follows:—

Treatment	No. of healthy seedlings	No. showing symptoms of wilting	Number completely wilted
3 pots per seedling	5	2	—
3 pots of water poured round the seedling	5	2	—
2 pots per seedling	2	5	—
2 pots of water poured round the seedling	5	2	—
1 pot per seedling	—	3	4
1 pot of water poured outside	2	5	—
Control (no watering)	—	—	7

It may be seen that the seedlings had completely wilted in the absence of any watering. Most of the seedlings which had been provided with three pots or which were pot watered with three or two pots of water were in healthy condition. For replenishment of water lost from the three pots, on an average only about half the quantity of water used in pot watering was needed, thus enabling much economy to be exercised.

That pots have been able to serve as a good and continuous source of moisture is seen from the soil moisture data furnished below;—

	Moisture percentage		
	0-12"	12"-24"	24"-36"
1. Underneath the plot	3.6	3.0	2.9
2. When 3 pots of water had been applied	2.1	2.9	3.2
3. When 2 pots of water had been applied	2.0	2.8	2.6
4. When one pot of water had been applied	2.1	2.7	3.2
5. Control (no water)	0.9	1.6	2.1

It is probably the better moisture reserve in the soil that kept the seedlings in a relatively good condition.

This study will be continued.

#### 5. *Inter-cropping in coconut plantations*

An attempt was made to raise dry paddy as a subsidiary crop in an acre of the coconut plantation during the south-west monsoon period. Two dry paddy strains PTB 29 and PTB 30 received from Agricultural Research Station, Pattambi were used for the purpose. The early growth of the crop was very unsatisfactory though a liberal application of ash had been given as basal dressing. Later on there was considerable improvement when ammonium sulphate was top dressed at about 1 cwt. per acre. The crop gave an acre yield of 485 lb. of grain and 480 lb. of straw. On working out the economics, the attempt was not remunerative and resulted in loss.

Subsequent to paddy a crop of horsegram was grown. Due to the partial failure of the North-east monsoon rains the crop gave only very poor yields and its cultivation was also a loss.

Pepper introduced as a subsidiary crop in earlier years is having fair growth. It has since established on *Erythrina* standards as well as on some coconut palms.

These trials will be continued.



## 6. *Irrigation with sea water and fresh water*

Observations which were in progress since 1951 were continued. The trial has as its objective the possibility of utilising, in summer, sea water for irrigating palms growing in sandy soil areas along the sea coast. The treatments included watering with sea water or fresh water with unwatered trees as control.

Increased yields due to watering were obtained since 1955 and no bad effect due to the use of sea water was seen. In general the yields of the experimental trees during 1958 were high. The data summarised below are in agreement with the observations made previously. There was absolutely no bad effect consequent on the use of sea water for irrigation.

	Mean yield of nuts per tree during 1959
Irrigation with sea water	82
Irrigation with fresh water	97
Control	67

The differences in yield were found to be largely due to the increased number of female flowers produced by the trees under irrigation when compared to the control. Setting percentage was comparatively low in watered trees when compared with the control. These will be clear from the following data.

	Mean No. of female flowers produced per tree	Mean setting percentage
Irrigation with sea water	224	36.6
Irrigation with fresh water	225	43.1
Control	138	48.6

A small scale trial was started during the year to study how the palms growing in red loam soil with low water table react to irrigation with sea water pure as well as diluted with fresh water. Observations are in progress.

The above studies will be continued.

## 7. Studies on green manure crops

Observations were continued on *Calopogonium mucunoides*, *Indigofera hirsuita*, *Crotalaria goreensis* and *Gliricidia maculata*.

*Calopogonium mucunoides* continued to produce good stand of crop from self-sown seeds. Of late the crop is found to dry up prematurely in patches. On visual examination no sign of pest or disease was apparently noticed. This feature will be carefully watched in future. The general pattern of growth exhibited was the same as observed in previous years.

Studies on the rate of spread of *Calopogonium* arising out of new growth showed it to be rather slow. It is the plants growing out from seeds that get shattered from the ripe pods that help to extend the area under the crop. New areas have been brought under this crop.

Observational trials on the management and manuring of the cover crop are proposed to be started next season.

A good crop of *Indigofera hirsuita* is coming up this season from self-sown seeds. The growth of *Crotalaria goreensis* is not good as it is found to be affected by a suspected virus disease. Further observations on it will be discontinued.

*Gliricidia* plants planted on the borders are coming up well. They were regularly pruned and the prunings applied to the coconut palms. Fresh planting was done on a large scale during the year.

Observations on green manure crops will be continued.

8. *Studies on the effect of lime on soil reaction and yield of the coconut palm*

The observational trial started in 1957 was continued. It had its first year of working during the year under report. Lime was applied at 12 lb. CaO per tree with and without the usual dose of fertilisers.

The yield data obtained under the experiment are summarised below:—

Treatments	Mean yield of nuts per tree during 1958 (adjusted)
(1) Lime alone (every year)	55.2
(2) Lime alone (in alternate years)	43.5
(3) Manure alone	63.2
(4) Lime (every year) + manure	49.5
(5) Control	46.7
General mean	53.1
Standard error per tree per plot	11.1
Coefficient of variation (%)	20.9
Improvement in precision by adopting covariance analysis (%)	258.3
Whether difference significant or not	Yes; $P < 0.01$
Critical difference ( $P=0.05$ )	8.09
Conclusion	(3), (1), (4), (5), (2)

Significant differences in yield were obtained during the year. Plot which was manured with fertilisers has given the maximum yields.

As in last year the changes in the pH of the soil in the differently treated plots were followed periodically. The data gathered subsequent to the ones reported in the previous progress report are furnished below:—



Treatment	Depth	Date of sampling			
		7-4-1958	31-7-1958	15-12-1958	24-4-'59
		(Before 2nd application of lime)	(Just before 2nd manuring)	Subsequent to 2nd manuring	(Before application of lime for the 3rd time)
Lime alone every year	0-6"	6.9	7.4	} 7.3	7.4
	6-12"	6.8	6.9		
	12-18"	6.4	6.4	} 6.8	6.6
	18-24"	6.4	6.2		
	24-30"	6.4	6.0	} 6.3	6.2
	30-36"	6.4	6.2		
Lime alone in alternate years	0-6"	6.9	7.4	} 7.3	7.2
	6-12"	6.8	6.8		
	12-18"	6.4	6.4	} 6.8	6.2
	18-24"	6.4	6.2		
	24-30"	6.4	6.2	} 6.2	6.1
	30-36"	6.4	6.2		
Lime (every year) + manuring	0-6"	7.0	7.3	} 7.4	7.1
	6-12"	6.8	6.8		
	12-18"	6.4	6.2	} 6.8	6.4
	18-24"	6.4	6.2		
	24-30"	6.4	6.0	} 6.6	6.2
	30-36"	6.4	6.0		
Manure alone	0-6"	6.0	6.2	} 6.0	6.0
	6-12"	6.1	6.2		
	12-18"	6.2	6.4	} 6.0	6.0
	18-24"	6.2	6.4		
	24-30"	6.4	6.4	} 6.0	6.0
	30-36"	6.4	6.4		
Control	0-6"	6.4	5.8	} 6.3	6.2
	6-12"	6.4	6.2		
	12-18"	6.4	6.4	} 6.2	6.2
	18-24"	6.4	6.4		
	24-30"	6.4	6.4	} 6.2	6.1
	30-36"	6.4	6.4		

It is seen that: (i) the effect of lime on pH is confined mainly to the first foot with a tendency to affect the second foot also on continued application every year, (ii) manuring depresses the pH but lime helps to counteract the effect.

The observations will be continued.

## 9. *Crop weather studies*

### (i) *Meteorological observations*

In Tables I and II of Appendix are summarised the data of important weather factors recorded during the year at the Agriculture meteorological observatory of the Station. The salient features are discussed below.

#### (a) *Rainfall*

The total rainfall for the year (4-6-1958 to 3-6-1959) amounted to 3532.7 mm. on 118 rainy days as against 3139.2 mm. and 109 rainy days of last year and the 20-year average of 3434.5 mm. and 117 rainy days. The South-west monsoon commenced a little later than usual, was active in the months of June, July and August and slackened in September. The amount of rainfall received during the South-west monsoon period was 2849.2 mm. as against the normal rainfall of 2721.4 mm. The North-east monsoon was a partial failure as only a total of 269.8 mm. was received as against the 20-year average of 374.0 mm. for the period. The hot weather period of 1959 was not so severe or prolonged as in last year. Good showers were received during April (latter half) and May and the total for the period amounted to 413.7 mm. as against the 20-year average of 339.1 mm. On the whole the season can be said to be not unfavourable for the coconut crop.

#### (b) *Temperature*

The highest maximum temperature recorded in a day was 37.4°C in the month of March 1959 and the lowest minimum of 19.9°C was recorded in the month of December 1958. The monthly mean daily maximum ranged from 28.9°C in August 1958 to 33.9°C for April 1959. Monthly mean daily minimum temperature ranged from 21.7°C for December 1958 to 25.9°C for April 1959.



(c) *Humidity*

Completely humid condition (100 per cent) prevailed for many days in the months of July, August, October and November 1958. The lowest humidity recorded (at 8 A.M. I. S. T.) was 63.1 in December 1958. The monthly mean daily humidity ranged from 82 per cent in December 1958 to 98 per cent in August 1958.

(d) *Wind velocity*

The wind velocity recorded at 10' from the ground was highest in the month of July 1958 (5.8 km. p. h.) as against the lowest (0.2 km. p. h.) in August 1958 and May 1959. On the whole the month of July 1958 was more windy (27 km. p. h.) and May 1959 least (1.0 km. per hour).

(e) *Sunshine*

The month of March 1959 had the highest number of hours of bright sunshine per day (9.6) while the lowest number (2.8) was for June 1959. The highest duration of sunshine recorded was 10.6 hours in the month of April. There was no sunshine on some days in the months of July, August, October and November 1958 and May and June, 1959.

(f) *Evaporation: Piche evaporimeter*

The evaporation for a single day recorded in the Piche evaporimeter kept within the Stevenson Screen was the highest (6.4 mm) in March, 1959 and the lowest (0.1 mm.) in August 1958. The monthly recorded daily evaporation ranged from 0.9 mm. (August 1958) to 4.3 mm. (April 1959).

*U. S. A. Evaporimeter*

During heavy rainy months the pan gets filled up often and the water overflows so much so evaporation data could not be collected. From the data available it is seen that the highest monthly mean daily evaporation was in March 1959 (6.0 mm.) and lowest (3.1 mm.) in September, 1958.

(ii) *Crop weather observations*

The young palms of the tall and dwarf varieties growing in a plot adjacent to the observatory were



continued to be observed for the various characters like leaf production, commencement of flowering, etc. The following is a summary of the observations.

	Mean No. of leaves produced during the year	Percentage of trees flowered so far
Tall brown	9.1	3.4
Tall green	7.8	—
Dwarf yellow	10.4	63.7
Dwarf green	10.1	70.0

Dwarf variety grows much more quickly than the tall and also flowers comparatively early.

(iii) *Studies on the development of buttons to the ripe nut*

Studies were continued on the development of buttons produced in the different months of the year to the ripe stage. The data will be analysed when one round of observations is completed.

The studies are being continued.

10. *Statistical investigations*

The Statistician who has been appointed to this station joined duty in the last quarter of the year under report. Besides rendering technical advice to the other sections in this Station as well as at the Central Coconut Research Station, Kayangulam and Regional Coconut Research Stations on the design of experiment, and analysis and interpretation of experimental data, he has just taken up studies on the following aspects:—

(i) Investigations on possible improvements in technique for increasing the precision of experiments on the coconut.

(ii) Method of selection of mother palms — selecting the best 10 per cent of the trees from each of the fields of the Station based on yields recorded for an even number of years.

The results of these studies will be reported in the next progress report.

## 11. *Miscellaneous*

### (i) *Transplanting adult coconut palms*

A bearing coconut palm transplanted in 1953 continued to be under observation. The improvement noted last year in its general condition is being maintained. Though the palm has established satisfactorily and is now 5 years since transplanting it has not reached the level of bearing of the pre-transplanting period. It gave only 7 nuts in 1957 and 10 nuts during 1958. Its mean annual yield during the 5-year period prior to transplanting was 75 nuts.

Observations are being continued.

### (ii) *Root pruning to induce bearing*

Non-bearing palms which were given severe root pruning in 1953 continued to be under observation. The palm subjected to this treatment produced inflorescences about 14 months after root pruning and subsequently is producing them regularly.

Observation on this will be discontinued.

### (iii) *Prevention of driage of husked nuts during storage*

Studies carried out during the previous year had shown that by giving a surface coating of paraffin to husked nuts it is possible to store coconuts without driage for as long a period as 34 weeks. During the year under report this investigation was continued with the object of determining the influence of shell thickness and thickness of the coating of paraffin on driage.

Two types of nuts, viz., thick shelled (5.8 mm) and thin shelled (3.8 mm) were used. To give different thickness the nuts were dipped in melted paraffin, once, twice or thrice. The mean quantity of paraffin taken up by the nuts given one dipping was 5.86 gm., two dippings 8.36 gm. and three dippings 11.36 gm. The nuts were stored in a ventilated room and weight taken every fortnight to record the loss of weight. The results so far obtained go to show that the difference in thickness of shells did not materially affect the loss in weight whereas the thickness of coating of paraffin did. The loss in weight suffered by the nuts within a period of about 4½ months was the following:—



	Thick shell	Thin shell
Dipped in paraffin once	12.3 %	15.8 %
do. twice	6.8 „	10.0 „
do. thrice	4.4 „	4.8 „
Control (Untreated)	32.2 „	33.2 „

The nuts under the control treatment had got dried up within 25 to 50 days. Nuts which were dipped once got dried up in about 4 months time. The others are having nut water inside and observations are being continued.

(iv) *Studies on improving the durability of plaited coconut leaves*

In order to find out whether chemical treatment of plaited coconut leaves will improve their durability, a small scale trial was started during the year with the following treatments.

- (1) Dried leaves soaked in sea water.
- (2) Green leaves without soaking.
- (3) Dried leaves soaked in a solution made up of copper sulphate (1 part), sodium dichromate (6 parts), boric acid (3 parts) and zinc chloride (5 parts) in 100 parts of water.

After soaking for two days, the leaves were taken out, dried and used for thatching a lean-to roof in the open. Observations are in progress and will be continued for a year before final assessment is made about the efficacy of the chemical treatment as compared to the others.

### Programme of work for 1959-60.

1. Manurial Experiments.
  - (i) NPK Manurial Experiment.
  - (ii) Trial of nitrogenous fertilisers.
  - (iii) Manuring cum irrigation experiment.
  - (iv) Method of application of manures.
  - (v) Manurial experiment on seedlings in sandy soil.
  - (vi) Preliminary experiments on foliar spraying.



2. (a) Study of the effect of neglect of coconut palms.  
(b) Cultural cum manurial experiment.
3. Yield studies.
4. Nursery studies.
5. Intercropping in coconut plantations.
6. Irrigation with sea water and fresh water.
7. Observations in green manure crops.
8. Studies on the effect of lime on soil reaction and yield.
9. Crop whether observations.
10. Miscellaneous.

## APPENDIX

**TABLE I – Rainfall Data**  
**Central Coconut Research Station, Kasaragod**

Standard week	Year 1958-1959		Year 1957-1958		Average for past 20 years	
	Quantity of Rainfall in mms.	No. of rainy days	Quantity of Rainfall in mms.	No. of rainy days	Quantity of Rainfall in mms.	No. of rainy days
23 June 4th to „ 10th	5.1	1	214.9	5	229.8	5.7
24 June 11th to „ 17th	212.9	5	111.8	4	269.5	6.3
25 June 18th to „ 24th	537.2	7	436.4	7	249.1	6.5
26 June 25th to July 1st	475.6	6	239.3	7	256.2	6.1
27 July 2nd to „ 8th	168.4	6	200.4	7	262.0	6.3
28 July 9th to „ 15th	308.6	5	535.9	7	224.1	6.6
29 July 16th to „ 22nd	149.8	6	150.9	6	265.9	6.3
30 July 23rd to „ 29th	203.7	6	97.0	7	210.5	6.3

31 July 30th						
to Aug. 5th	163.3	3	248.2	6	144.1	5.7
32 Aug. 6th						
to „ 12th	130.4	5	51.6	2	143.9	5.3
33 Aug. 13th						
to „ 19th	83.4	7	84.1	6	110.9	4.9
34 Aug. 20th						
to „ 26th	288.5	7	264.9	6	126.7	5.1
35 Aug. 27th						
to Sept. 2nd	54.9	7	64.0	4	66.0	3.9
36 Sept. 3rd						
to „ 9th	29.4	5	9.7	1	66.1	4.4
37 Sept. 10th						
to „ 16th	37.0	4	40.3	5	36.1	2.5
38 Sept. 17th						
to „ 23rd	1.0	0	43.4	1	60.5	3.2

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Total	2849.2	80	2792.8	81	2721.4	85.1
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39 Sept. 24th						
to „ 30th	4.3	0	0.0	0	57.4	2.9
40 Oct. 1st						
to „ 7th	5.6	1	3.8	1	61.1	2.5
41 Oct. 8th						
to „ 14th	48.8	4	16.4	3	53.6	2.2
42 Oct. 15th						
to „ 21st	68.5	4	52.5	5	46.4	2.3
43 Oct. 22nd						
to „ 28th	0.0	0	42.2	2	37.1	1.9
44 Oct. 29th						
to Nov. 4th	0.0	0	7.1	1	23.4	1.3
45 Nov. 5th						
to „ 11th	6.9	1	72.7	2	19.0	1.2
46 Nov. 12th						
to „ 18th	1.5	0	16.5	2	26.6	1.3

N. E. M O N S O O N	47 Nov. 19th						
	to „ 25th	133.4	3	0.0	0	18.6	1.0
	48 Nov. 26th						
	to Dec. 2nd	0.8	0	0.0	0	2.6	0.3
	49 Dec. 3rd						
	to Dec. 9th	0.0	0	0.0	0	12.8	0.3
	50 Dec. 10th						
	to Dec. 16th	0.0	0	0.0	0	9.8	0.4
	51 Dec. 17th						
	to Dec. 23rd	0.0	0	0.0	0	1.8	0.2
	52 Dec. 24th						
	to „ 31st	0.0	0	0.0	0	0.1	0.0
	1 Jan. 1st						
	to „ 7th	0.0	0	0.0	0	2.6	0.1
	2 Jan. 8th						
	to „ 14th	0.0	0	0.0	0	0.2	0.1
	3 Jan. 15th						
	to „ 21st	0.0	0	0.0	0	0.5	0.1
	4 Jan. 22nd						
	to „ 28th	0.0	0	0.0	0	0.4	0.1
Total		269.8	13	211.2	16	374.0	18.2

Total of S.  
W. and N.

E. Monsoon	3119.0	93	3004.0	97	3095.4	103.3
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5 Jan. 29th						
to Feb. 4th	0.0	0	0.0	0	0.5	0.1
6 Feb. 5th						
to „ 11th	0.0	0	0.0	0	0.1	0.0
7 Feb. 12th						
to „ 18th	0.0	0	0.0	0	2.1	0.2
8 Feb. 19th						
to „ 25th	0.0	0	0.0	0	2.7	0.1
9 Feb. 26th						
to Mar. 4th	0.0	0	0.0	0	1.0	0.1
10 Mar. 5th						
to „ 11th	0.0	0	0.0	0	0.7	0.1
11 Mar. 12th						
to „ 18th	0.0	0	0.0	0	3.1	0.1



12 Mar. 19th to „ 25th	0.0	0	0.0	0	0.1	0.0
13 Mar. 26th to April 1st	0.0	0	0.0	0	1.6	0.1
14 April 2nd to „ 8th	8.6	1	0.0	0	2.3	0.3
15 April 9th to „ 15th	7.9	1	1.0	0	13.3	0.9
16 April 16th to „ 22nd	1.3	0	5.4	1	13.2	0.9
17 April 23rd to „ 29th	48.0	2	4.6	1	23.2	1.3
18 April 30th to May 6th	23.1	2	27.9	2	18.6	1.1
19 May 7th to „ 13th	29.8	2	4.4	1	14.0	0.8
20 May 14th to „ 20th	65.9	5	46.2	3	60.9	1.8
21 May 21st to „ 27th	79.2	5	19.8	3	74.8	2.8
22 May 28th to June 3rd	149.9	7	25.9	1	106.9	3.1
Total	413.7	25	135.2	12	339.1	13.8
Grand Total	3532.7	118	3139.2	109	3434.5	117.1

TABLE II

Summary of weather data excluding rainfall for the period from July 1958 to June 1959 — Central Coconut Research Station, Kasaragod

Month	Maximum temperature in °C			Minimum temperature in °C			Humidity %			Wind velocity in km. p. h.			Sunshine per day in hours			Piche evaporimeter evaporation in mms			U. S. A. evaporimeter evaporation in mms.		
	Highest	Lowest	Average	Highest	Lowest	Average	Highest	Lowest	Average	Highest	Lowest	Average	Highest	Lowest	Average	Highest	Lowest	Average	Highest	Lowest	Average
July 1958	31.4	27.1	29.8	27.1	22.9	24.2	100	83	93	5.1	0.7	2.7	9.6	0.0	3.2	2.5	0.3	1.3	—	—	—
August "	30.9	24.7	28.9	25.8	22.1	23.7	100	91	98	4.2	0.2	1.7	7.9	0.0	2.9	1.7	0.1	0.9	—	—	—
September "	31.2	28.3	30.0	25.3	22.2	23.6	98	88	95	2.7	0.3	1.3	9.8	2.1	6.5	2.7	0.9	1.5	6.0	1.1	3.1
October "	31.2	27.2	29.9	25.2	21.6	23.4	100	86	95	2.8	0.3	1.4	9.3	0.0	6.3	2.4	0.6	1.5	5.8	1.7	3.7
November "	34.1	27.3	32.0	25.3	20.7	23.5	100	64	91	3.6	0.3	1.5	9.8	0.0	7.6	5.6	0.8	2.7	6.2	2.1	3.7
December "	35.2	31.6	33.3	23.1	19.9	21.7	97	63	82	2.7	1.1	1.8	9.9	6.4	9.3	5.4	0.5	2.9	6.2	2.6	4.7
January 1959	36.1	31.2	32.9	23.8	20.1	21.9	97	71	91	3.0	1.1	1.9	9.9	6.3	9.5	5.3	0.6	3.6	6.5	3.9	5.0
February "	33.4	30.9	32.3	26.2	20.4	22.4	98	87	94	3.3	1.0	1.7	9.8	8.9	9.3	5.2	0.8	3.3	6.6	2.9	5.1
March "	37.4	32.7	33.5	26.2	22.7	24.2	98	72	90	2.2	1.1	1.5	9.7	9.3	9.6	6.4	2.4	4.1	8.6	4.5	6.0
April "	34.7	32.1	33.9	28.9	23.0	25.9	100	66	83	1.9	0.3	1.1	10.5	1.8	8.7	6.1	2.7	4.3	8.3	3.7	5.9
May "	35.2	26.6	32.4	28.4	21.4	25.3	100	77	89	2.7	0.2	1.0	10.0	0.0	5.4	4.6	0.9	2.9	7.8	1.7	4.5
June "	32.1	26.4	29.8	25.2	22.4	23.9	100	87	92	2.8	0.0	0.4	10.1	0.0	2.8	2.7	0.4	1.4	4.9	0.8	3.2

1. The U. S. A. evaporimeter readings of July and August are not available as the evaporimeter got filled up due to rains. Also a few readings of October, May and June are not available.
2. The Anemometer readings of June are suspected.

## IV. CHEMISTRY

### 1. *Soil studies*

#### (a) *Soil survey of the coconut growing tracts*

A detailed scheme of soil survey of the coconut growing tracts of India with a view to ultimately prepare a soil map of the regions which would help to correctly classify the soils as well as to guide in planning research, advisory and extension work in coconut development was started. The work has been initiated in the Cannanore district of the Kerala State which is a very typical representative area in the coconut belt of the West Coast and a reconnaissance survey of eight villages of the northernmost taluk, viz., the Kasaragod taluk was carried out. Thirty-two soil samples collected from fourteen sites have been analysed and the results tabulated. The work will now be continued to cover adjacent coconut areas.

#### (b) *Soil survey of the Central Coconut Research Station area, Kasaragod*

The analysis of further samples of soils collected from the different profile pits of this Research Station was continued. The major nutrients in twelve and exchangeable bases in twenty-four samples of soils were completed and the results tabulated.

#### (c) *Studies on the soil-plant nutrient correlations in the coconut palm*

In order to evaluate the fertility status of soils drawn from the NPK manurial and the cultural experimental plots (vide items 1 and 2 Agronomy) and to study the correlations of these with the major nutrient status of the leaf tissues of the palms standing in the respective plots, a systematic analytical study of the major nutrient factors in the soils of the different experimental plots and in the leaves of trees standing in the respective plots has been initiated. Samples of soils and leaf tissues drawn from the two categories of plots (receiving manurial treatments and cultural treatments) were thus analysed for their plant food ingredients. Eighty soil samples and eight tissue samples were analysed in this connection and the results tabulated. This work will



continue until sufficient analytical data for statistical examination gets accumulated.

(d) *Studies on the rationale of common salt application to coconut soils*

A field experiment to verify the truth of certain beneficial attributes usually made to the application of common salt to coconut soils was in progress for the past five years. However, no marked effect of salt application on moisture conservation was noted although there were clear indications of the differences in the mean moisture content between soil types and between the different depths of sampling. At comparable periods gravelly laterite soils had in general the highest moisture percentage, sandy soil the least and loamy soil occupying a middle position. The moisture content steadily increased with depth in all the soils (control as well as salt applied) under this study.

This experiment was continued with a view to ascertain whether the common salt had any effect in releasing available potassium making a ready supply to the growing palm. The pH and available potassium content of forty-three samples of soil and exchangeable calcium in eighteen soil samples collected from the plots were determined and the data tabulated. A slight increase in the available potassium content was indeed noticed in the case of sandy soils receiving common salt at the rate of 900 lb. per acre. It is proposed to determine the values for exchangeable calcium and exchangeable sodium also in the soils. The following table presents the results of analysis in connection with these studies. Table 1.

(e) *Influence of lime on laterite soils*

Quite a large area in the laterite soils of the West Coast is now under coconuts. Although initially very productive, these soils being rather shallow, steadily show a set back in the yield and health of the palms. With a view to elucidate the beneficial changes which may attend the application of lime to these soils which are acidic, a field experiment was laid out during the year. Lime was applied in pits at one foot and three feet depths at the rate of five and ten lb. per pit. Soils

from these pits have been sampled prior to lime application and examined for the reaction and the contents of total and available nutrients. The study will be continued and sufficient data will be collected for statistical examination.

## 2. *Studies on cocount tissues*

### (a) *Nutritional aspects of barren nut incidence in the coconut*

In order to elucidate the factors responsible for the formation of barren nuts a comparative study of the chemical composition of kernels from good and barren nuts from selected bunches in selected palms was in progress at this Research Station for the past three years. The results had shown that there were some differences in the quantities of nutrient factors in the two categories of nuts. The study was continued to confirm these findings. Typical results of analysis of the good and barren nuts are given in the following table – Table 2.

These show that there is a considerable accumulation of NPK and Mg. in the barren nut kernel, confirming earlier observations. It could be concluded that the formation of barren nuts is neither due to any soil deficiency of the major nutrients nor their non availability at the site of physiological action and biosynthesis and that faulty metabolism due to some other factor was responsible for the phenomenon. Chemical analyses of the husks and shells of good and barren nuts have also been carried out, but the results so far have not shown anything indicative or conclusive. Other factors such as sugar content, amino acid content, etc. of the good and barren nut kernels would now be looked for and comparative data collected to throw light on the problem of barren nut formation from the point of view of nutrition.

### (b) *Nutritional aspects of foliar yellowing in the coconut palm*

A field experiment was in progress at this Research Station to study the manurial aspects in relation to the common phenomenon observed in coconut gardens of the West Coast and called seasonal reversible foliar yellowing. The palms under this experiment received



TABLE I

Results of analysis of soil samples from the studies on the effect of the addition of common salt to cocont soils

Treatment	Depth	RED LOAM			SANDY SOIL			LATERITE SOIL		
		Before applica- tion of common salt	After applica- tion of common salt	Av. K <sub>2</sub> O %	Before applica- tion of common salt	After applica- tion of common salt	Av. K <sub>2</sub> O %	Before applica- tion of common salt	After applica- tion of common salt	Av. K <sub>2</sub> O %
		pH	pH	pH	pH	pH	pH	pH	pH	pH
Control	1st ft.	6.1	0.0024	6.4	0.0027	6.8	0.0026	6.8	0.0034	6.9
"	2nd ft.	"	0.0039	6.0	0.0024	6.9	0.0022	6.9	0.0034	6.8
"	3rd ft.	"	0.0034	6.5	0.0045	—	—	—	—	—
NaCl @ 600 lb/acre	1st ft.	"	0.0031	6.6	0.0037	6.9	0.0022	6.9	0.0037	6.8
"	2nd ft.	"	0.0031	6.4	0.0034	6.8	0.0012	6.8	0.0024	6.7
"	3rd ft.	"	0.0038	6.4	0.0034	—	—	—	—	—
NaCl @ 900 lb/acre	1st ft.	"	0.0024	6.4	0.0031	6.9	0.0019	6.9	0.0086	6.6
"	2nd ft.	"	0.0024	6.4	0.0024	6.9	0.0015	6.9	0.0082	6.7
"	3rd ft.	"	0.0015	6.5	0.0031	—	—	—	—	—
KCl @ 765 lb/acre	1st ft.	"	0.0080	—	—	6.8	0.0024	—	—	—
"	2nd ft.	"	0.0046	—	—	6.8	0.0019	—	—	—
"	3rd ft.	"	0.0041	—	—	—	—	—	—	—

Note:— 1. In the case of sandy and laterite soil, 3rd ft. samples were not taken.  
2. Treatment with KCl is excluded from this experiment.



**TABLE 2**  
**Analytical data on Barren and Good nuts**

Description of Sample	Moisture (%) on dry weight basis			N (%)			P <sub>2</sub> O <sub>5</sub> (%)			K <sub>2</sub> O (%)			CaO (%)			MgO (%)		
	Kernel	Shell	Husk	Kernel	Shell	Husk	Kernel	Shell	Husk	Kernel	Shell	Husk	Kernel	Shell	Husk	Kernel	Shell	Husk
Barren nut	213.20	—	—	1.582	0.112	0.266	0.547	0.034	0.062	1.977	0.197	0.736	Trace	Trace	0.112	0.180	0.020	0.040
"	159.20	—	—	1.638	0.112	0.252	0.500	0.025	0.059	2.423	0.120	0.711	"	"	0.140	0.180	0.040	0.040
Good nut	65.50	—	—	1.120	0.042	0.210	0.402	0.022	0.056	0.548	0.120	0.633	"	"	0.112	0.100	0.080	0.040
Barren nut	388.80	—	—	2.268	0.154	0.168	0.957	0.037	0.065	2.200	0.591	0.959	"	"	0.112	0.200	0.100	0.040
Good nut	99.30	—	—	1.077	0.056	0.182	0.454	0.068	0.053	0.830	0.154	1.130	"	"	0.140	0.120	0.040	0.080
Barren nut	345.90	24.74	140.30	0.020	0.224	0.280	1.079	0.102	0.102	2.086	0.291	1.550	"	0.056	0.140	0.160	0.020	0.100
Good nut	78.02	21.04	128.40	1.232	0.140	0.224	0.500	0.071	0.077	0.865	0.402	1.678	"	0.140	0.084	0.100	0.020	0.120
Barren nut	268.00	10.98	135.30	1.582	0.238	0.308	0.911	0.071	0.105	2.054	0.163	0.736	0.056	Trace	0.084	0.100	0.040	0.120
"	121.60	18.13	46.10	1.330	0.224	0.350	0.954	0.062	0.127	0.753	0.188	0.514	0.056	0.042	0.112	0.260	0.020	0.160
Good nut	73.43	18.69	135.30	1.050	0.182	0.322	0.562	0.065	0.093	1.455	0.214	0.471	0.056	0.028	0.084	0.120	Trace	0.120

their annual application of complete fertilisers (containing a basal macro and one micro nutrient each, five replications in all). The usual observations were taken and recorded. Statistical analysis of the data on the number of green and yellow leaves collected during the year revealed that the application of copper, molybdenum, boron, magnesium, manganese and iron has significantly reduced the foliar yellowing when supplied with the usual N. P. and K. as compared to the control treatment (NPK only). Copper and molybdenum, however, were found to be equally effective and in fact appeared to be superior to the other treatments. Next to these, boron appeared to be the best. These results confirm the findings of the earlier years as can be seen from the summary of the results of analysis shown in the table given below:—

**TABLE 3**

**Showing the summary of results of analysis of the observations under the experiment on foliar yellowing of coconut trees**

Sl. No.	Treatments	Average number of yellow leaves taken as a fraction of the total number of leaves			Average
		1956-57	1957-58	1958-59	
1.	N + P + K (Control)	0.192	0.137	0.189	0.173
2.	N + P + K + Fe.	0.155	0.120	0.145	0.140
3.	N + P + K + Ca.	0.148	0.113	0.110	0.124
4.	N + P + K + Zn.	0.148	0.180	0.185	0.238
5.	N + P + K + Mn.	0.133	0.142	0.144	0.140
6.	N + P + K + B	0.112	0.04	0.120	0.112
7.	N + P + K + Mg.	0.145	0.138	0.129	0.137
8.	N + P + K + Mo.	0.090	0.096	0.110	0.099

9.	N + P + K + Lime.	0.143	0.141	0.175	0.153
10.	N + P + K + common salt.	0.162	0.200	0.186	0.183
11.	Critical difference for testing any two treatments (P = .05)	0.0034	0.0027	0.0045	—

The figures for the previous years have also been indicated in the table. The statistical analysis of the data on the number of green and yellow leaves show that there has been a significant variation among the different treatments when the number of yellow leaves are taken as the fraction of the total number of leaves. It is clear that molybdenum and copper to a large extent, and boron to some extent do ameliorate the foliar yellowing condition when these are supplemented to the soil to the normal NPK additions to the trees.

A field experiment has been started at Trikaripur about 24 miles south of Kasaragod where foliar yellowing of palms is highly prevalent with a view to demonstrate the results of this study in a ryot's own garden.

(c) *Studies on the chemical composition of nuts during the different stages of development*

Since a knowledge of the variation in the nutrient constituents of the tissues of the coconut during the different stages of development from the button to the mature nut would help to throw light on the biosynthetic processes of oil, fibre, sugar, proteins, etc., a systematic chemical analysis of the nut from the stage of setting to the stage of attaining ripeness was conducted. The results are presented in the following tables - 4 to 9.



**TABLE 4**

Showing the physical variations undergoing in the  
different parts of the developing nuts

Stage of development of the nut	Husk		Shell		Kernel		Water
	Dry weight in gm.	Moist- ure %	Dry weight in gm.	Moist- ure %	Dry weight in gm.	Moist- ure %	Volume in cc.
1st month	3.93	78.87	—	—	—	—	—
2nd "	9.55	79.74	—	—	—	—	—
3rd "	30.45	80.00	—	—	—	—	7-9
4th "	54.09	80.57	2.34	88.91	—	—	34
5th "	89.54	82.64	5.01	88.47	—	—	110
6th "	167.51	82.97	7.81	91.50	—	—	265
7th "	205.88	83.40	36.00	69.73	3.08	90.45	272
8th "	380.79	85.97	102.30	24.18	17.23	85.86	350
9th "	376.70	82.28	113.41	25.88	54.23	70.67	180
10th "	335.05	80.69	119.18	24.59	80.66	63.40	135
11th "	371.51	72.15	134.91	21.00	166.77	48.05	146
12th "	343.91	66.92	144.20	19.86	165.09	41.87	120
13th "	370.52	57.42	141.17	19.33	165.52	37.54	98

**TABLE 5**

Showing the percentage of oil and free fatty  
acid in the developing kernel

Stage of develop- ment of the nut	7th month	8th month	9th month	10th month	11th month	12th month	13th month
Percentage of oil in the kernel	26.3	55.1	60.4	66.6	69.6	71.0	71.2
Free Fatty Acid (expressed as mg. of KOH)	6.4	5.1	1.5	0.84	0.80	0.52	0.52

**TABLE 6**

**Showing the percentage of nutrients in husks  
from developing nuts**

Stage of develop- ment of the nut	N %	P <sub>2</sub> O <sub>5</sub> %	K <sub>2</sub> O %	CaO %	MgO %
1st month	0.784	0.340	1.353	0.202	0.160
2nd „	0.728	0.383	1.342	0.269	0.128
3rd „	0.770	0.353	1.130	0.246	0.128
4th „	0.618	0.278	0.675	0.269	0.208
5th „	0.560	0.241	0.421	0.246	0.080
6th „	0.630	0.253	0.531	0.246	0.096
7th „	0.686	0.272	0.784	0.269	0.096
8th „	0.658	0.296	0.736	0.269	0.096
9th „	0.518	0.278	0.633	0.157	0.080
10th „	0.406	0.235	0.616	0.179	0.064
11th „	0.322	0.203	0.616	0.179	0.080
12th „	0.336	0.185	0.651	0.157	0.064
13th „	0.364	0.105	0.852	0.157	0.064

**TABLE 7**

**Showing the percentage of nutrients in shells  
from the developing nuts**

Stage of develop- ment of the nut	N %	P <sub>2</sub> O <sub>5</sub> %	K <sub>2</sub> O %	CaO %	MgO %
4th month	2.030	1.377	2.400	0.134	0.384
5th „	2.058	1.343	1.924	0.224	0.560
6th „	2.380	1.049	0.948	0.134	0.480
7th „	0.980	0.334	0.764	0.112	0.224
8th „	0.322	0.148	0.322	0.094	0.176
9th „	0.266	0.099	0.195	0.067	0.080
10th „	0.262	0.124	0.213	0.094	0.080
11th „	0.308	0.105	0.273	0.067	0.032
12th „	0.196	0.099	0.205	0.067	0.064
13th „	0.168	0.089	0.164	0.094	0.032

TABLE 8

Showing the percentage of nutrients in kernels  
from developing nuts.

Stage of develop- ment of the nut	N%	P <sub>2</sub> O <sub>5</sub> %	K <sub>2</sub> O%	CaO%	MgO%
7th month	1.932	0.856	2.715	0.155	0.448
8th "	2.324	0.934	1.798	0.134	0.400
9th "	1.592	0.673	1.479	0.134	0.176
10th "	1.386	0.642	1.058	0.094	0.224
11th "	1.330	0.636	0.534	0.094	0.160
12th "	1.292	0.587	0.649	0.094	0.064
13th "	1.162	0.514	0.397	0.094	0.064

TABLE 9

Showing the composition of nut water from nuts  
in different stages of development

Stage of develop- ment of the nut	Reducing sugars expressed as Glu- cose %	Non-reducing sugars expressed as Glucose %	Total sugars ex- pressed as Glu- cose %	N%	P <sub>2</sub> O <sub>5</sub> %	K <sub>2</sub> O%	CaO%	MgO%
3rd month	0.50	Nil	0.50	—	—	—	—	—
4th "	0.84	Nil	0.84	0.008	0.004	0.367	0.085	0.049
5th "	1.65	Nil	1.65	0.008	0.008	0.271	0.062	0.053
6th "	3.11	Nil	3.11	0.015	0.016	0.200	0.035	0.094
7th "	4.76	0.02	4.78	0.014	0.021	0.235	0.035	0.088
8th "	4.74	0.08	4.82	0.020	0.018	0.256	0.044	0.123
9th "	3.95	1.19	5.14	0.027	0.024	0.179	0.031	0.166
10th "	1.33	1.99	3.32	0.027	0.017	0.155	0.028	0.166
11th "	0.75	1.56	2.31	0.034	0.022	0.167	0.030	0.210
12th "	0.52	1.67	2.19	0.031	0.018	0.203	0.031	0.200
13th "	0.25	1.83	2.09	0.027	0.014	0.189	0.036	0.166

An examination of the data reveals the following facts:—

The husk attains maximum dry weight in the eighth month, shell in the twelfth month and kernel in the



eleventh month. The maximum quantity of water is found in the eighth month of development of the nut. The moisture content decreased in the different parts as nuts reached maturity. A calculation based on the maximum quantity of dry matter in the different parts shows that the percentage development of husk and shell is maximum between 7th and 8th months, and kernel between 10th and 11th months.

The synthesis of oil in the kernel progresses even up to the 13th month of development of the nut and the free fatty acids decrease with maturity. The percentage synthesis of oil based on the oil present in the mature kernel is found to be maximum between 10th and 11th months of development of the kernel.

The percentage of nutrients is found to decrease in the different parts of the coconut with maturity. But the absolute amounts of nutrients are found to increase till the growth of the respective portions are complete and then register a decrease. Thus there is indication of translocation of nutrients from the different parts with maturity.

Qualitative and quantitative changes in coconut water are noticed during ripening of the nut. From the most immature nut in which the cavity has just formed to about the seven month old fruit when it is full size but still unripe, the sugars present which are entirely reducing sugars increase to a maximum of 4.8 per cent concentration. Thereafter non-reducing sugars appear, but the total concentration falls to about 2 per cent in the fully ripe nut, 12 to 13 months old.

### 3. *Studies on the keeping quality of coconut oil cake in storage*

Laboratory experiments to study the storage characteristics of two samples of coconut oil cake, viz., (1) deoiled cake and (2) Singapore mixed cake, were conducted. The samples were stored for over nine months under seven different modes of packing, such as (1) Gunny bag, (2) Gunny bag over which Gammoxane is dusted, (3) Alkathene lined gunny bag, (4) closed drum, (5) Closed drum inside which calcium chloride is

kept, (6) Kept exposed, (7) kept in bulk in gunny bags. The samples were examined periodically for moisture, oil and protein content. The results are tabulated in Table 10.

It was observed that on storing, softening of cake by absorption of moisture took place in all samples except in the one kept in closed tin in presence of  $\text{CaCl}_2$ . This sample, stored under dry condition, kept well and showed least deterioration during the period of storage. It was also observed that considerable amount of intrinsic heat was evolved during bulk storage, thereby accelerating the spoilage of stored cake. The sample kept in closed tin gave a high free fatty acid content at the end of the storage period and had also developed off-flavour. The results indicate that the best way of storage of coconut oil cake is to store it in a dry, well ventilated place.

Further storage trials on coconut oil cake with more careful details regarding changes in free fatty acid content and rancidity development etc., have been started.

#### 4. *Observational trials with miscellaneous fertilisers*

The efficiency of an NK fertiliser (mostly a nitrogenous fertiliser) from sea biterms compared to ammonium sulphate as well as that of trisodium phosphate (for acidic soils) compared to superphosphate as alternatives to ammonium sulphate and superphosphate respectively was tried and the yield data of the trees statistically analysed. The results revealed that for the past four years of treatment the NK fertilizer is in no way superior to ammonium sulphate. Similarly there was no significant yield increase with the trisodium phosphate compared to superphosphate. From an experiment conducted similarly with common salt it was seen that there was no yield increase in the salt applied plots compared to the controls (no salt).

The results of the examination of the data are given in the Tables 11, 12 and 13.







TABLE 11

Showing the results of statistical analysis of the yield data of trees under trial with NK fertiliser from sea bitterns

Treatments	Average yield for different years				
	Before trial		During trial		
	1954	1955	1956	1957	1958
NK fertiliser + superphosphate + Muriate of potash	77	78	68	58	62
Ammonium sulphate + superphosphate + Muriate of potash	90	62	72	56	69
Control or no manure	76	71	56	52	57
Common salt + superphosphate + ammonium sulphate	72	58	74	55	59
Whether observed differences (mean yields) are significant or not	—	No	No	No	No

TABLE 12

Showing the results of the statistical analysis of the yield data of trees under trial with trisodium phosphate

Treatment	No. of observa- tions	Average yield for different years					% increase in yield over 1954				
		pre- treat- ment	Under treatment					1955	1956	1957	1958
			1954	1955	1956	1957	1958				
Control (no manure)	5	19	24	39	24	20	24	104	24	4	
Ammonium sulphate + superphosphate + muriate of potash	11	20	27	44	43	30	33	120	116	49	
Ammonium sulphate + trisodium phos- phate + muriate of potash	5	25	26	47	38	36	24	84	51	43	
Whether the diffe- rences are significant or not			No	No	No	No					

TABLE 13

Showing the comparative analysis of the mean yields of control and common salt treated plots (10 lb. per tree)

Treatment	No. of observations	Average yield of different years (nuts)				
		Before the trial period 1954	During the trial period			
			1955	1956	1957	1958
Control – No salt	7	76	71	56	52	57
Common salt						
10 lb. per tree	7	85	64	67	40	53
Whether the observed deviation is significant or not			No	No	No	No

In view of the difficulty in procuring the fertiliser substitutes and in view of the absence of any tendency to give increased yields in the palms, these trials are proposed to be discontinued. The residual effects of the application of these would however be followed up in the coming year.

5. *Studies on the visual nutrient deficiency symptoms in coconut seedlings*

The sand culture experiment which was in progress was continued for the third year in succession to study the characteristic deficiency symptoms exhibited by the seedlings supplied with fertilisers containing N, P, K either alone and in combination. The details of the experiment have been given in the previous annual reports. Leaf compositions of the seedlings under the different treatments were determined and are presented in table 14.



TABLE 14

Showing the nutrient contents of the leaves from coconut seedlings under the study of NPK deficiency symptoms

Treatment	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	CaO	MgO
		P e r c e n t			
Control	1.064	0.1884	1.9602	0.700	0.744
N <sub>1</sub>	2.156	0.1749	1.5120	0.373	0.420
P <sub>1</sub>	0.980	0.2573	2.1829	0.653	0.700
K <sub>1</sub>	0.952	0.1801	2.6679	0.653	0.640
N <sub>1</sub> P <sub>1</sub>	2.268	0.5095	0.9701	0.233	0.080
N <sub>1</sub> K <sub>1</sub>	1.820	0.1698	2.9960	0.233	0.360
P <sub>1</sub> K <sub>1</sub>	0.8960	0.3088	2.7106	0.796	0.620
N <sub>1</sub> P <sub>1</sub> K <sub>1</sub>	1.9040	0.3802	3.5524	0.233	0.280
N <sub>2</sub>	3.029	0.1544	1.3838	0.280	0.180
P <sub>2</sub>	0.840	0.2099	2.1742	0.728	0.600
K <sub>2</sub>	0.840	0.1749	3.4382	0.467	0.2800
N <sub>2</sub> P <sub>2</sub>	2.296	0.2955	0.6420	0.187	0.1600
N <sub>2</sub> K <sub>2</sub>	1.904	0.1853	3.1672	0.280	0.2200
P <sub>2</sub> K <sub>2</sub>	0.784	0.6948	3.8948	0.560	0.4200
N <sub>2</sub> P <sub>2</sub> K <sub>2</sub>	1.960	0.1035	3.1101	0.280	0.1200

The results revealed that the addition of nitrogen either alone or in combination with phosphorus or potash increased the nitrogen content of the leaf. Though the increase in the nitrogen status of the leaf is not proportional to the quantity of these nutrients applied certainly the double dose has given better effect in all cases. The maximum increase (more than doubled in comparison with the control) is being noticed when nitrogen is given alone at double dose. The addition of phosphorus or potash alone has shown only adverse effect on nitrogen content. Further potash depressed the nitrogen content of the leaf when added singly or in combination with phosphorus.

Though the addition of phosphorus has increased the P<sub>2</sub>O<sub>5</sub> content of the leaf above the control level, the single dose appears to be superior to the double dose. It is interesting to note that the NP treatment -



especially when applied at single dose – increased significantly both the  $P_2O_5$  and nitrogen contents. The maximum increase in the level of  $P_2O_5$  was observed when the combination PK was given at double dose. The addition of nitrogen and potash singly at all levels has shown practically no beneficial effect on the  $P_2O_5$  content.

The addition of nitrogen either alone or in combination with phosphorus decreased the  $K_2O$  content as compared to the control treatment. P and K treatments either alone or in combination with N (leaving out the combination NP) have increased the  $K_2O$  status of the leaf. The combination PK at double dose has given the best effect.

All treatments except  $P_2$  and the combination  $P_1K_1$  (PK at single dose) decreased the calcium content of the leaf. Further the addition of N with P, K or PK decreased substantially the calcium status in comparison with the control.

While the addition of phosphorus at single or double dose has no effect, its addition along with others such as N, K or NK decreased significantly the magnesium content of the leaf.

#### *Notes on the observations on the seedlings*

The untreated seedlings in general did not show any notable change in appearance over the three year period but recorded reasonable growth. On the other hand there was definite improvement in regard to both absence of deficiency symptoms, as well as in increase in vigour in certain treatments and definite deficiency symptoms in certain other treatments. For example the seedlings which were nitrogen-starved showed an yellow leaf colour. Seedlings receiving  $N_1P_1K_1$  and  $N_2P_2K_2$  showed better growth than all the others. There was no appreciable difference in growth rate between the seedlings under the treatment  $N_1P_1K_1$  and  $N_2P_2K_2$  showing that NPK at the lower level used was adequate for the nutrition needs of the seedlings. N with P appears to be better than N with K as far as the growth is concerned. Taking individual nutrients it is clear that N

helped better growth of the seedlings than others. Yellowing and the drying up of leaf tips are also noticed on seedlings receiving P and K. It is also very interesting that seedlings under the treatment with N and P, N and K, and NP and K showed a tendency for early splitting of the leaves while PK alone does not appear to influence the early leaf splitting character.

This experiment would be continued to ascertain whether further deficiency symptoms would develop.

#### 6. *General analytical work*

The different analytical determinations on soils, coconut tissues and fertiliser samples from the various items of work in progress at this research station and those carried out for advisory help during the year totalled 1080, including 643 soil samples, 190 tissue samples, 245 coconut oil cake samples and 2 manure samples. The determination included chemical and mechanical analysis of soil samples, major nutrients, sugars, tannin, etc. of several coconut tissue samples, moisture, protein, free fatty acid and residual oil content of oil cake samples as well as the lime content of manure samples.

### **Programme of Work for 1959-60**

1. Soil studies.
2. Tissue analytical studies.
3. Studies on copra, coconut oil and coconut oil cake.
4. Observational fertiliser trials.
5. Studies on the visual nutrient deficiency symptoms in coconut seedlings.
6. Soil survey work.
7. General analytical work.

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## **V. GENERAL**

### 1. *Supply of improved planting material*

The demand for coconut seedlings raised at this Research Station continued to be considerably heavy, as in previous years. A total number of 12,376 selected



quality seedlings were supplied during the period under report. The scheme for the procurement and supply of seed coconuts to State Governments experiencing difficulty in obtaining quality seednuts started on the 5th March, 1958 continued its work and a total number of 92,075 quality seednuts were supplied to the States of Assam, Tripura and West Bengal.

## 2. *Training*

Training on improved methods of coconut cultivation was, at the instance of Government of India, imparted to Mr. L. C. Zuniga, a Philippine national, deputed by the Philippine Government. Similarly one batch of Instructors in Agriculture of Basic Agricultural Schools and Extension Training Centres deputed by Government of Kerala and two batches of trainees deputed by the Government of Madras were also given training.

## 3. *Special Sub-committee for drawing up a Breeding Programme*

The special Sub-Committee, with Dr. S. M. Sikka, Additional Agricultural Commissioner with Government of India as Chairman, set up by the Indian Central Coconut Committee to draw up a detailed long-range programme for the genetical and breeding work on coconuts to be carried out at this Station, met at this Research Station in April, 1959. Their report is expected and recommendations implemented as early as possible.

## 4. *Exhibitions*

Suitable exhibits were sent from this Research Station to all the exhibitions in which the Indian Central Coconut Committee participated. Besides, exhibits were also supplied for display in the Secretariat office of the Committee at Ernakulam and for the exhibition at Trivandrum arranged by the Committee on the occasion of the 26th meeting of the Committee.

## 5. *Liaison between Research Workers and Extension Staff.*

Close liaison between staff and extension workers with the object of popularising improved methods of



coconut cultivation among growers was continued to be maintained as in previous years. Members of staff were deputed to Gram Sevak Training camps, Village Leaders' Training camps, etc., to deliver lectures on improved methods of coconut cultivation.

#### 6. *Tours*

The Joint Director and the Agronomist attended the meeting of the Potascheme held at Bangalore and the Nursery Officers' Conference held at Mangalore. The Joint Director also attended meetings of the Indian Central Coconut Committee and Indian Central Arecanut Committee held at Trivandrum and the meeting of the Technological Sub-Committee held at Ernakulam. The Agronomist was on tour to Simla to attend the Seminar on Recent Advances in Agronomy and Soil Science. Himself and a Research Assistant conducted an inspection tour in Kerala to inspect all the Coconut nurseries in Kerala run jointly by the Kerala State and the Indian Central Coconut Committee, with a view to study and report on the present working of the nurseries. The Agronomist was also on tour to inspect the coconut plantations of the Desamangalam Rubber Estates and render necessary advice and to coconut seed areas in Badagara from where seednuts are procured for supply to the different State Governments. The Joint Director and the Agronomist attended the Sub-committee meeting for discussing the programme of the Regional Research Stations in Kerala held at Nileshwar.

#### 7. *Advisory*

Advice on improved methods of coconut cultivation was given to a large number of coconut growers. Advice was also imparted to two research officers of the Regional Agricultural Research Stations, Mysore and West Bengal. The numerous enquiries received in this Station regarding various aspects of coconut cultivation reveal the increasing interest among coconut cultivators to adopt improved methods of cultivation.

#### 8. *Remarks of the Indian Central Coconut Committee on previous year's report*

<i>Remarks</i>	<i>Action taken</i>
i) As the correlation between the leaf area of a coconut palm and the nut yield had not yet been determined, studies regarding it should be undertaken.	The correlation between leaf area and yield has not been worked out, but the fact that a positive correlation has been obtained between the number of fully opened leaves on the crown and yield, suggests that some correlation may be expected between leaf area and yield. However attempts will be made to work out the correlation.
ii) With regard to the figures given under the headings "Study of seedlings" and "Study of indigenous varieties" in the report the number of plants on which the summary is based should be stated.	Information regarding the number of plants on which the summary is based will be given in future reports.
iii) The figures regarding the results of the higher and lower doses of fertilisers require to be checked up and explained as well as the statement regarding the relation between the quality of the nut and the application of fertilisers.	The figures regarding the results of higher and lower doses of fertilisers have been checked up and found to be correct. The statements given under the tables have, however, been modified suitably.
iv) When planting exotic varieties, the West Coast Tall variety should be planted as a control for comparison, this being a standard variety.	The West Coast Tall variety has been planted as control wherever possible.



- v) Steps should be taken to try and ensure better arrangements for the transport from abroad of nuts for experimental purposes. Action has already been taken by this office and the Indian Council of Agricultural Research to ensure better arrangements for the speedy transport of nuts from abroad.

9. *Publications*

The following articles were contributed for publication:-

- 1 Studies on soil conditions in relation to the root and leaf diseases of the coconut palm - Part IV.
- 2 Optimum stage of harvesting coconuts for different purposes.
- 3 A note on the comparative study of seedlings of natural cross dwarf and tall male and those of pure dwarf in nursery.
- 4 Studies on soil conditions in relation to the root and leaf diseases of the coconut palm - Part V.
- 5 Coconut Nursery Studies. II. Method of collecting seednuts.
- 6 How to plant coconut seedlings in sandy soil.
- 7 Underplanting and New planting.
- 8 All about the production of quality coconut seedlings.
- 9 Heteropollination in the improvement of the coconut.
- 10 Nature's hand in the production of good hybrid seedlings in coconut.
- 11 Training of hybrids in the improvement of coconut.
- 12 Laboratory studies on the influence of sodium chloride on soil moisture conservation in some coconut soils.
- 13 Field studies on the influence of common salt on moisture conservation in coconut soils.
- 14 Total tannin in shed coconut buttons.
- 15 A note on the abnormal development in an oil palm.
- 16 A preliminary note on the heritability of yield in the coconut.
- 17 Feeding of plants through leaves.
- 18 Five foreign forms in a fine coconut plantation.
- 19 Dwarf coconuts on plantation scale.
- 20 Albinism in coconut seedlings.



## APPENDIX V

### Secretary's Note

*Subject No. 12.* Scheme for the estimation of the distance over which coconut pollen is carried by insects.

The Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India at its meeting held in June, 1956 had considered the problems relating to the production of elite seeds in cross pollinated perennial trees with particular reference to coconut. One of the matters discussed at the meeting was the setting up of nucleus plantations in isolated centres to raise pure uncontaminated seeds. The meeting had recommended that it was desirable to gather fundamental data on the mechanism of pollination and the distance over which the pollen is carried either by wind or by insects, before starting the nucleus plantations. The Government of India have suggested that this Committee should take necessary action to implement the above recommendations.

The work in respect of studying the mechanism of pollination in the coconut and investigating the distance over which pollen is carried by wind, is accordingly being undertaken at the Committee's Central Coconut Research Station, Kasaragod. As regards determining the range of flight of insects carrying coconut pollen, fifteen Entomologists of different States were addressed, but none of them has been able to supply the data on the flight of the insects except that of bees. It has, therefore, been decided that this item of work should be taken up at the Committee's Central Coconut Research Station, Kayangulam. The Director of the station has therefore prepared a scheme for the purpose. A copy of his letter received in this connection together with a copy of the scheme is attached to this note.

The Government of India have suggested that the scheme be placed before the Committee at this meeting for technical scrutiny and approval.

The subject may first be considered by the Agricultural Research and Development Sub-Committee (Research Wing).



Copy of the letter No. C. 3732/306/59 dated 11th August, 1959 from the Director, Central Coconut Research Station, Kayangulam to the Secretary, Indian Central Coconut Committee, Ernakulam.

Sub:- Production of elite seeds - estimation of the distance over which pollen is carried by insects.

Ref:- Your letter No. F. 376/59 dated 30th July, 1959.

With reference to your letter cited above, I am enclosing herewith the broad outlines of a scheme for the implementation of the above-mentioned work.

The scheme is to run at the Central Coconut Research Station, Kayangulam as a part of the regular work of the Entomology Section for a period of three years. As a preliminary to this we have already done some work on the very common pollinating insects of coconut. For this a regular collection of insects visiting inflorescence is made at the Central Coconut Research Station, Kayangulam. They are examined for the presence of pollen grains on their body. Those insect species, members of which regularly show pollen on their body, are considered to play some definite part in the pollination of the palm. So far the most common insects collected and identified are members of the *Apis* group. The work is in progress.

**Production of elite seeds-Estimation of the distance over which pollen is carried by insects—**

**Scheme for Investigations**

*Object:-* Part played by insects in the pollination of the coconut palm - Their flight range etc.

*Duration:-* Scheme to run for a period of 3 years for the present.



*Materials:-* Honey bees being the most common of the pollinating insects, they will be chosen as material for this investigation. Six colonies of honey bees are being established in Block I of the Central Coconut Research Station plantation. The only available and practical way of tagging is by dusting them with printer's dust (silver or gold) or Fluorescent dust.

*Methods:-* Two methods will be adopted for the present.

(1) Tagging and liberating them at various distances from the hive and recovering them from the hive.

(2) Tagging and liberating them at a particular spot and recovering them from various distances from that spot.

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## APPENDIX VI

### Secretary's Note

*Subject No. 13.* Establishment of permanent Research Sub-Stations—Suggestion for.

A meeting of the Secretaries of the Commodity Committees was held in New Delhi in July, 1959 under the Chairmanship of Dr. M. S. Randhawa, Vice-President, Indian Council of Agricultural Research to discuss matters of common interest. Among other things the pattern of financial assistance in respect of research schemes financed by the various Commodity Committees was discussed at that meeting. Dr. Sethi, Secretary, Indian Central Cotton Committee, suggested that all the research schemes on cotton should be financed in full by his Committee for a period of 15 (fifteen) years. Dr. Sikka, Additional Agricultural Commissioner with the Government of India observed that when a particular research scheme is sanctioned for a specified period, some new problems crop up in the meantime, necessitating in



many cases further extension being given to the scheme. He was, therefore, of the view that there should be some sort of permanency in the schemes and that instead of the Commodity Committees sanctioning research schemes for specified periods, Research Sub-Stations should be opened on a permanent basis at the State level where work on a number of schemes might be undertaken. This procedure, it was considered, would give a sense of security to the staff working under the scheme and ensure continuity of the research work being done.

Dr. B. P. Pal, Director, Indian Agricultural Research Institute, who was also present at the meeting endorsed the views of Dr. Sikka. The Chairman of the meeting also pointed out that even if permanent Sub-Stations are set up, the Commodity Committees could insist upon a periodical review of the work done as at present.

The meeting finally decided that the matter should be examined separately by each Committee and decisions taken at their annual meeting.

According to the existing "General conditions" of the Committee, research schemes may be financed by the Committee upto a period of 10 years, the Committee meeting 50% of the recurring expenditure. To justify further financial help from the Committee after this period, special scientific or technical reasons have to be given and the Committee's share of recurring expenditure will be limited to 33½% during the extension period.

A list of the Regional Coconut Research Stations financed by the Committee indicating their duration and dates of commencement is given below:—

Location of the R.C.R.S.	Duration	Date of Commencement.
1. Regional Coconut Research Station, Neyyattinkara, Kerala State.	15 years	22-12-1947

	Location of the R. C. R.S.	Duration	Date of Commencement.
2.	Regional Coconut Research Station, Kumarakam, Kerala State.	15 Years.	22-12-1947
3.	Regional Coconut Research Station, Arsikere, Mysore.	2 years 9 months and 1 day (upto 31-3-1961)	30-6-1958
4.	Regional Coconut Research Station, Veppankulam, Madras State.	3 years and 4 days (upto 31-3-1961)	28-3-1958
5.	Regional Coconut Research Station, Ambajipeta, Andhra Pradesh.	5 Years	18-5-1955
6.	Regional Coconut Research Station, Bhatye, Bombay State.	5 Years	1-7-1955
7.	Regional Coconut Research Station, Sakhigopal, Orissa State.	6 years, 2 months and 21 days (upto 31-3-'61)	11-1-1955
8.	Regional Coconut Research Station, Kahikuchi, Assam.	5 Years	9-4-1957

The Committee may now decide whether they would approve of the suggestion to set up permanent Research Sub-Stations at State level and if so what the pattern of financing and administration and technical control should be.

The subject may be considered first by the Agricultural Research and Development Sub-Committee (Research Wing).



## APPENDIX VII

### Secretary's Note

*Subject No. 15.* Proceedings of the Special Sub-committee for reviewing the future set up of the Regional Coconut Research Stations in Kerala State.

The Indian Central Coconut Committee at its last meeting (January 1959), while considering the report submitted by Mr. C. M. John and Dr. K. M. Pandalai on the work done at the Regional Coconut Research Stations in Kerala State had decided that in the matter of the future set up of the Regional Coconut Research Stations a Special Sub-Committee consisting of Mr. C. M. John, Dr. K. M. Pandalai and Shri T. Gopalan Nair, Joint Director of Agriculture (Research), Department of Agriculture, Kerala State be set up to review the position and make recommendations. (Vide Sub. No. 15 of the proceedings of that meeting). In the unavoidable absence of Shri Gopalan Nair, the Director of Agriculture, Kerala State deputed Shri L. S. S. Kumar, Additional Director of Agriculture (Research) and Principal, Agricultural College, Vellayani as substitute member and convener of the Sub-Committee meeting. The Sub-Committee met on the 26th and 27th July, 1959 at Nilesishwar and a copy of the proceedings of the meeting of the Sub-Committee is attached.

Some of the main recommendations of the Sub-Committee are summarised below:—

1. Intensification of the study of exotic varieties and hybrid progenies at Pilicode and Nilesishwar II on a planned basis in collaboration with the Central Coconut Research Station, Kasaragod under a scheme to be jointly financed by the Committee and the Kerala Government.

2. Establishment of a permanent Regional Coconut Research Station to represent the loose sandy soil coconut tract of the coastal area between Ambalapuzha and Shertalai.



3. Early implementation of the suggestions made by the previous Sub-Committee in respect of the Kumarakam and Neyyattinkara Stations, viz., that to the Kumarakam Station must be added a reclamation area of at least 50 acres and that steps must be taken to develop the station into a first class Regional Coconut Research Station and that a new site representing the red loam soil type of Neyyattinkara should be acquired for starting a station on a permanent basis.

4. For carrying out work in accordance with the programme of the Manorial Trials Sub-Committee, an area of 30 acres should be acquired at each site to establish new plantations.

5. The Director, Central Coconut Research Station, Kayangulam and the Agronomist, Central Coconut Research Station, Kasaragod of the Indian Central Coconut Committee should be associated with the work of selecting suitable sites and

6. a Coconut Specialist in the cadre of the Deputy Director of Agriculture should be appointed to direct and co-ordinate the work of all the Regional Coconut Research Stations as well as the work proposed to be done at Pilicode and Nileshwar II.

The Government of Kerala have stated that they are in agreement with the recommendations of the Sub-Committee.

The Committee may now decide whether the recommendations of the Special Sub-Committee may be accepted.

The subject may be considered first by the Agricultural Research and Development Sub-Committee (Research Wing).

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Proceedings of the meeting of the Special Sub-Committee appointed for reviewing the future set up of the Regional Coconut Research Stations in Kerala State, held on 26th and 27th June 1959 at the Agricultural Research Station, Nileshtar.

*Present:*

Sri. C. M. John  
Dr. K. M. Pandalai  
Sri. L. S. S. Kumar nominated by the Director of Agriculture, Kerala in place of Sri. T. Gopalan Nair.

*Invitees:*

Dr. K. P. V. Menon, Director, Central Coconut Research Station, Kayangulam.  
Sri. M. M. Krishna Marar, Agronomist, Central Coconut Research Station, Kasaragod.  
Sri. P. M. Sayeed, Pepper Research Officer, Taliparamba.  
Sri. O. V. Ummerkutty, District Agricultural Officer, Tellicherry.  
Sri. A. P. Anandan, Superintendent, Agricultural Research Station, Nileshtar.

Sri. C. M. John drew the attention of the members to the report containing the review of the work done at the Regional Coconut Research Stations at Thodupuzha, Kumarakam and Pachallur in Neyyattinkara submitted to the Indian Central Coconut Committee by Dr. Pandalai and Sri. John in which they had recommended the re-examination of the future set up of the Regional Coconut Research Stations in view of the transfer of the Coconut Research Stations, Pilicode, Nileshtar II and III to the Kerala State as a result of the re-organisation of the State *Vis-a-vis* the existence of the two Central Coconut Research Stations of the Indian Central



Coconut Committee at Kasaragod and Kayangulam. This was done with a view to see that while every important coconut region of Kerala had a regional research station, there was no duplication or unnecessary overlapping of research work.

The Sub-Committee noted that Kerala State has at present two Regional Coconut Research Stations, one at Kumarakam (Backwater reclaimed clay soil) on a permanent basis and the other at Pachallur in Neyyattinkara (red loam soil type) on lease basis and financed jointly by the State Government and the Indian Central Coconut Committee. The Regional Station at Thodupuzha (laterite soil) was abolished but no new station to represent the above soil type has been yet started. Action has also not been taken to establish a Regional Station for the red loam soil type of Neyyattinkara area on a permanent basis in lieu of the existing station at Pachallur as recommended by the Sub-Committee in their earlier report.

In addition to the above two Regional Research Stations, the Kerala State has acquired by transfer from Madras State three Agricultural (Coconut) Research Stations, one at Pilicode (gravelly soil) and two at Nileswhar representing light red soil and deep littoral sandy soil respectively. The work carried out at these stations is generally a continuation of the work that was being done when the stations were under the Madras Department of Agriculture with certain elaborations in some cases. The main work done at these stations is briefly indicated below:—

I. *Agricultural Research Station, Pilicode (Gravelly Soil)*

- i) Study of exotic varieties..
- ii) Study of the progenies of inter and intra varietal crosses.
- iii) Progeny studies of selected palms of  
Kasaragod.
- iv) Manurial-cum-cultural experiments.



II. *Agricultural Research Station, Nileshtar II* (Light red sandy loam soil)

- i) Studies of progenies of six different yield groups x three methods of pollination planted in a randomised and replicated lay out.
- ii) Studies of the progenies of cyclic crosses.
- iii) Study of the progenies of Tall x Dwarf crosses.

III. *Agricultural Research Station, Nileshtar III* (Deep littoral sand)

- i) Study on depth of planting of seedlings.
- ii) Study of the progenies of mother palms from four different seed centres and
- iii) nursery work.

It may thus be seen that the investigations carried out at Pilicode and Nileshtar II Stations are mostly of a fundamental nature while that at Nileshtar III is of a regional (agronomic) nature.

The Sub-Committee went into the whole matter against the above back-ground and recommends re-organisation of the present set up and working of the Coconut Research Stations of the Kerala State as detailed below:-

1. Intensifying the study of exotic varieties and hybrid progenies at Pilicode and Nileshtar II on a planned basis in collaboration with Central Coconut Research Station, Kasaragod under a scheme to be financed jointly by the Indian Central Coconut Committee and Kerala State so that adequate staff and facilities become available for undertaking these important items of work for which field material is available. It may be recalled that some of the items of investigation were initiated under a scheme financed by the Indian Central Coconut Committee but subsequently dropped since the Madras Government thought that they could continue the work themselves. It is now felt that this very important work which will furnish good lot of valuable information on coconut breeding should be pursued properly without further neglect.

2. Establishment of a permanent Regional Coconut Research Station to represent the loose sandy soil coconut tract of the coastal area between Ambalapuzha and Shertalai since Nileshtar III Station which has also a sandy soil does not represent the conditions prevailing in the above tract.

3. Developing the Agricultural Research Station at Nileshtar III into a full fledged Regional Research Station to tackle problems relating to sandy soil with deep water table.

4. Early implementation of the suggestions put forward by the Sub-Committee in their previous report in regard to the Regional Stations at Kumarakam and Pachallur (Neyyattinkara).

5. The establishment of a permanent Regional Station to represent the laterite gravelly soil found in the uplands between the backwater and the eastern hill slopes. This station is proposed in lieu of the recently abolished regional station at Thodupuzha.

6. The Sub-Committee further recommends that the lines of work to be carried out at the Regional Stations will generally conform to the programme formulated by the Manurial Trials Sub-Committee. Greater emphasis should however be laid on the management and agronomy of coconut plantations right from the start. It would therefore be necessary to acquire an area of not less than 30 acres at each of the sites for establishing new plantations. The Regional Station to be developed at Nileshtar III should also take up investigation on the installation of filter points and irrigation-cum-manurial aspects as well as the problem of underplanting in sandy soil.

7. Prof. L. S. S. Kumar informed the Sub-Committee of the proposal of the Kerala State to bring under coconut cultivation large areas in the extensive sandy tract lying between Kadinankulam and Veli in the Trivandrum District in the Third Five-Year Plan. The Sub-Committee noted with interest this proposal but ventured to suggest the execution of a pilot scheme for this purpose to begin with.



8. Since the recommendation of this Sub-Committee is to establish these Regional Stations on a permanent basis it is very important that proper attention is paid to the selection of suitable sites. It would be therefore desirable to associate in this work, the Director and the Agronomist of the Indian Central Coconut Committee as they have experience of the various coconut tracts of India and would be in a position to help the Department of Agriculture in selecting suitable sites.

9. The Sub-Committee strongly feels that in view of the anticipated expanding volume of work covering the entire State of Kerala, the appointment of a Coconut Specialist in the cadre of Deputy Director of Agriculture would be necessary to direct and co-ordinate the work of all the Regional Coconut Research Stations as well as the work proposed to be done at Pilicode and Nileshwar II. It may be recalled that the Sub-Committee in their previous report had drawn the attention of the authorities to the lack of proper technical supervision and guidance of the then existing three Regional Coconut Research Stations and how the progress of work had suffered on this account. Coconut is a very important crop of Kerala State and great importance has to be given to research on regional basis and its proper execution.

(Sd.) C. M. John.

(Sd.) K. M. Pandalai.

(Sd.) L. S. S. Kumar.

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## APPENDIX VIII

### Secretary's Note

#### EXTENSION SCHEME

*Subject No. 19.* Regional Coconut Research Station Scheme, Ambajipeta, Andhra Pradesh – Proposal for the extension of.

1. Name of the Scheme : Regional Coconut Research Station Scheme, Andhra Pradesh.
2. Location : Ambajipeta.
3. Object of the Scheme : To investigate on a regional basis the agronomical problems connected with coconut cultivation.
4. Date of commencement of the Scheme : 18-5-1955.
5. Date of termination of the present Scheme : 17-5-1960.
6. Results achieved (in brief) : Trials conducted have shown that Philippines, Andaman Ordinary and Sakhigopal varieties of the coconut palm are more vigorous than the other extra-State and exotic varieties introduced at the Station, that sunn-hemp is the best green manure crop and that turmeric and banana are the most remunerative inter-crops.
7. Reason for extension : The agronomical experiments at the Station are only in the initial stages. They have to be conducted for a minimum period of six

years to yield definite results. The trials of "extra-State varieties" and "plantation performance of selected progenies" have also to be continued till at least 3 years after full bearing stage is reached. Hence it is essential to continue the scheme.

8. Duration of extension: 18-5-1960 to 31-3-1961.  
(Separate proposals will be submitted to continue the scheme during the III 5-Year Plan)

9. Cost of extension.

(a) *Expenditure*

Non-recurring : Rs. 200  
Recurring : Rs. 19,660.

Share of the Committee (50% of the recurring expenditure) Rs. 9,830.

Share of the State Government (entire non-recurring & 50% of the recurring expenditure) : Rs 10,030.

(b) Receipts : Rs. 7,000

Share of the Committee (50%) : Rs. 3,500

Share of the State Government (50%) : Rs. 3,500

(c) Net Cost : Rs. 12,860

Share of the Committee : Rs. 6,330

Share of the State Government : Rs. 6,530.

10. Remarks of the Secretariat on the proposal

(1) The proposal now forwarded is for the continuance of the scheme till the end of the Second Plan period, that is, till 31-3-1961. It is stated that proposals for extending the scheme till the end of the Third Plan period will be submitted separately.

(2) The existing staff at the station will be continued. The scales of pay attached to the posts have however been revised. The original and revised scales of pay are given below:

<i>Designation of post.</i>	<i>Old Scales</i>	<i>Revised scales.</i>
Superintendent	Rs. 230-30/2-260-40/2-500-50/2-700	Rs. 250-20-450-25-600
Assistant	Rs. 100-5-140-EB-10-220	Rs. 150-7 $\frac{1}{2}$ -210-10-300
Fieldman	Rs. 45-2-55-1-60	Rs. 50-3-92-4-100
Lower Division Clerk	Rs. 45-3-60	Rs. 50-3-92-4-120
Peon	Rs. 18- $\frac{1}{2}$ -25	Rs. 26-1-40.

Apparently there has been a general revision in the scales of pay in the State. It is, however, stated that the revised scales of pay corresponds to the scales of pay attached to posts of similar status in the State Government.



(3) The recurring expenditure and receipts are proposed to be shared on 50 : 50 basis in accordance with the General Conditions Applicable to Grants Made by the Committee.

The Committee may now decide whether they would approve of the proposal to extend the scheme from 18-5-1960 to 31-3-1961 at a net cost to the Committee not exceeding Rs. 6,330.

The subject may be considered first by the Agricultural Research and Development Sub-Committee (Research Wing).

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**A scheme for the continuance of the Regional Coconut Research Station, Ambajipet (Andhra Pradesh) from 18-5-'60 to 31-3-'61.**

**I. *Introduction:-***

The scheme for the establishment of the Regional Coconut Research Station, Ambajipet, was sanctioned for 5 years in G. O. No. 855 Food and Agriculture, dated 28-4-'51; No. 730 Food & Agriculture, dated 28-4-'52 of the Government of Madras and G. O. No. 715 dated 28-3-'56 of the Government of Andhra from 18-5-'55 to 17-5-'60. As the sanction expires by 17-5-'60, proposals are submitted herewith for continuance of the scheme from 18-5-'60 to 31-3-'61 (i. e.) till the end of the Second Plan period. Proposals for the continuance of the scheme during the Third Five-Year Plan period will be submitted separately.

## II. *Object and necessity for the scheme:-*

Andhra Pradesh produces about 1/13 of the total coconut production of India and in the drive to make the country self-sufficient the State, too, has to increase its production by about 30%. To achieve this, it is, *inter alia*, necessary to advocate optimal manurial and cultural schedules besides introducing better varieties. With these as primary objectives, the Station was established to conduct, on a regional basis, research on the agronomical problems (cultural, manurial and varietal) of coconut cultivation in the tract. The bearing area earmarked for the cultural and manurial experiments has just been standardised and the scheduled treatments are to be given in 1959. Coconut being a perennial crop of unique nature, all the agronomical experiments have to be conducted for a minimum period of about six years (because of the inevitable time lag between the adoption of agronomical treatments and their effect being reflected in the yield of nuts). The "trial of extra-State varieties" and the fundamental study "plantation performance of selected progenies", which have been started, have to be continued till at least 3 years after full bearing stage is reached. Hence, it is essential to continue the scheme. A scheme for the next 5 years (1-4-'61 to 31-3-'66 for the Third Five-Year Plan period will be submitted separately.

## III. *Technical Programme:*

It is proposed to continue all the experiments started during the first five years as per approved technical programme of work. The main items of the programme of work are listed below:-

1. Introduction and acclimatisation of exotic and extra-State varieties.
2. Plantation performance of selected progenies (a fundamental study) to investigate the nature of inheritance of economic characters.
3. Inter-cultivation-cum-manurial experiment (to fix up the optimum cultivation schedule for the tract).

4. Comprehensive NPK manurial trial (to determine the best manurial schedule) with N, P and K each at 3 levels on the factorial design;
5. Rhinoceros beetle control trial (a comprehensive trial with the latest pesticides) as designed by the Director, Central Coconut Research Station, Kayangulam, for the Regional Stations;
6. Green Manure Trial to fix up the best green manure crop for raising in coconut gardens. The trial is to be conducted with promising varieties of green manures;
7. *Inter-cropping trial*: This is a trial to fix up the most remunerative inter-crop for coconut gardens and study later, its effect on the coconut yields.
8. Multiplication and distribution of "Gangabondam" (as per the recommendation of the Committee).

IV. *Work done so far:*

Furnished separately in Annexure-I.

V. *Targets fixed:*

There are no physical targets fixed, as this is a Research Scheme.

VI. *Duration:*

It is proposed to continue the scheme for the period 18-5-'60 to 31-3-'61. Proposals for continuance of the scheme during the Third Five-Year Plan period will be submitted separately.

VII. *Venue:*

Ambajipet, East Godavari District, Andhra Pradesh.

VIII. *Staff:*

The sanctioned staff now existing will be continued.

The staff proposed to be employed during the extension period is detailed below:—



S. No.	Designation	No. of posts
1.	Superintendent	1
2.	Upper Subordinate	1
3.	Fieldmen	2
4.	Lower Division Clerk	1
5.	Peon	1

#### IX. *Administration:*

The scheme will be under the over all technical and administrative control of the Oilseeds Specialist, Rajendranagar, and in the immediate charge of the Superintendent, Coconut Research Station, Ambajipet.

#### X. *Finance:*

The expenditure and receipts in respect of the scheme period will be borne by the Government of Andhra Pradesh and the Indian Central Coconut Committee as per the rules 20 and 23 of the "General conditions applicable to grants made by the Indian Central Coconut Committee".

#### *Basis of Apportionment:*

	Indian Central Coconut Committee	State
Non-recurring expenditure:	—	100%
Recurring expenditure:	50%	50%
Receipts	50%	50%

The total cost of the scheme is Rs. 19,860/- while the receipts anticipated are to the tune of Rs. 7,000/- as per estimates enclosed.

#### *Share of the State Government:*

Expenditure	...	Rs. 10,030
Receipts	...	Rs. 3,500
Net cost		<u>Rs. 6,530</u>

*Share of the Indian Central  
Coconut Committee:*

Expenditure	...	Rs.	9,830
Receipts	...	Rs.	3,500
Net cost		Rs.	<u>6,330</u>

*Certified that:*

- (a) The scales of pay, allowances, etc. proposed above are those admissible to persons of corresponding status employed under the Central, State Government, etc.
- (b) The present scheme cannot be combined with any scheme
  - (i) financed entirely by the Central and State Governments, Universities or private institutions from their own funds, or
  - (ii) financed by or submitted to any of the Central Commodity Committees or the Indian Council of Agricultural Research.
- (c) Necessary provision for the scheme will be made in the State budget in anticipation of the sanction of the scheme by the Committee.

(Sd) Oilseeds Specialist  
Andhra Pradesh

**A B S T R A C T**

S. No.	Particulars.	Amount
		Rs.
A.	<i>Non-recurring Expenditure:</i>	
1.	Dead Stock	<u>200</u>
	Total Non-recurring	<u>200</u>

8	Recurring Expenditure	12,407
1	Pay	2,407
2	Dormitory Allowance	875
3	Travelling Allowance	2,400
4	Other charges (cultivation charges)	19,680
	Total recurring	19,680
	Total expenditure	19,680
	Total receipts anticipated	7,000
	Net cost of the scheme	12,680

*Share of the Indian Central Coconut Commission*

5%	of recurring expenditure	984
Deduct 5%	of receipts anticipated	350
	Net cost	634

*Share of State Government*

	Non-recurring expenditure	241
	50% of recurring expenditure	9,840
	Total	10,081
	Deduct 5% of receipts anticipated	350
	Net cost	9,731

(3d) Orissa Special  
Andhra Pradesh

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*Scheme for continuance of the Coconut Research Station, Ambajipet. Extension proposals for the period 18.5.1960 to 31.3.1961*

*A. Non-recurring Expenditure*

Dead Stock - Implements, Bamboo and other miscellaneous items	2,400
Total	2,400



### *Recurring Expenditure*

<i>Pay</i>	
1) One Superintendent (Rs. 250-20-450-25-600) at Rs. 290 for 15 months and 13 days and Rs. 310 for 5 months	3,121
2) One Assistant (Rs. 150-74-210-10-300) at Rs. 165 p.m. for 5 months and 13 days and for 5 months at Rs. 172½	1,719
3) Two Fieldmen (Rs. 50-3-92-4-100) one at Rs. 68 p.m. and one at Rs. 56 p.m. for 5 months and 13 days and Rs. 71 + Rs. 59 p.m. for 5 months	1,325
4) One Lower Division Clerk (Rs. 50-3-92-4-120 at Rs. 50 p.m. for 10 months and 13 days	521
5) One Peon (Rs. 26-1-40) at Rs. 27 p.m. for 10 months and 13 days	262
<b>Total</b>	<u><u>6,968</u></u>

### *Dearness Allowance.*

1) One Superintendent at Rs. 58 p.m. for 5 months and 13 days and Rs. 60 p.m. for 5 months	614
2) One Assistant at Rs. 40 p.m. for 10 months and 13 days	417
3) Two Fieldmen, one at Rs. 34 and one at Rs. 35 p.m. for 10 months and 13 days	719
4) One Lower Division Clerk at Rs. 34 for 10 months and 13 days	354
5) One Peon at Rs. 30 for 10 months and 13 days	313
<b>Total</b>	<u><u>2,417</u></u>

### *Travelling Allowance*

For 10 months and 13 days at Rs. 1,000 per annum	875
<b>Total</b>	<u><u>875</u></u>

IV. *Other Charges (Working Expenses):*

S. No.	Particulars	Amount Rs.
1.	Cultivation charges for 60 acres at Rs. 90 per acre:	5,400
2.	Office Contingencies:	440
3.	Pay of Maistry at Rs. 20 p. m. and 3 Watchmen at Rs. 15 p. m. for 10 months and 13 days:	677.
4.	Dearness Allowance to 4 persons (1 Maistry and 3 Watchmen) at Rs. 18 p. m. each for 10 months and 13 days:	750
5.	Maintenance of cattle (including cost of cattle foods) 2 pairs at Rs. 130 p. m. for 10 months & 13 days:	1,360
6.	Raising inter-crops in 1½ acres for the inter-cropping experiments.	750
7.	Miscellaneous items and unforeseen contingencies:	23
	Total	<u>9,400</u>

*Receipts:*

By sale of coconuts at Rs. 7,000 per annum for 10 months and 13 days:	6,000
From inter-crops:	900
Miscellaneous receipts:	100
Total	<u>7,000</u>

*Note:* The receipts will be low as the entire bearing plantation has been (for purposes of standardisation by recording pretreatment data of yield of nuts as a preliminary to starting the various experiments) under 'No manure' conditions during the current scheme period. Further the bearing area contains a large number of palms in advanced stages of senile decay.

(Sd) Oilseeds Specialist,  
Andhra Pradesh.

## ANNEXURE I

### A note on the work done at the Coconut Research Station, Ambajipet.

#### *Introduction:*

The Regional Coconut Research Station, Ambajipet was established in May, 1955 (18-5-1955) in an area of 60.26 acres acquired at Ambajipet (Amalapuram Taluq of East Godavari District). The station has 41.28 acres of bearing plantation and 18.98 acres of vacant land to be utilised for fresh planting, with 4 years old seedlings for future experimentation on agronomical problems. As the vacant land is low lying, proposals have *inter alia* been submitted for raising the level of the land by bulldozing at a cost of Rs. 10,000 (Vide D. Dis. Research II. (3) 377/57 dated 5-1-'59 of the Director of Agriculture, Andhra Pradesh, Hyderabad (Dn.) to the Secretary, Agriculture Department, Andhra Pradesh, Hyderabad (Dn.) under copy to the Secretary, Indian Central Coconut Committee for consideration at its 26th meeting). The work is scheduled to be taken up in November, 1959 after sanction is accorded. A brief summary of the work done so far is given below:-

#### *General:*

The technical programme of work was drawn up in accordance with the recommendation of the Special Sub-Committee of the Indian Central Coconut Committee and submitted for approval. The entire bearing plantation was standardised as per the prescribed procedure by recording palm-wise yield of nuts as pre-treatment data. The scheduled agronomical treatments are to be given in 1959 after the approval of the programme. Progress of work item-wise is given below:-

#### 1) *Introduction and acclimatisation of economic extra state varieties:*

Thirteen promising extra state and exotic varieties and T x D Hybrid are included in the trial (Laccadive ordinary, Laccadive small, Andaman ordinary, Philippines, New Guinea, Cochin China, Fiji, Siam, var spicata, Nyuirgading, Java, Sakhigopal and T x D Hybrid). Available



number of seedlings of all the varieties except Nyuirgading were obtained and planted in the second nursery to plant them later when about 4 years old as per local practices. From the general observations in the nursery Philippines, Andaman Ordinary and Sakhigopal appear to be more vigorous than the rest.

2) *Plantation performance of 'Selected' progenies:*

This is a long-range experiment designed to study the nature of inheritance of economic characters of the mother palms, by the progenies 'Selected' as per the technique now in vogue in the Government nursery schemes. Twenty motherpalms on the station were chosen for the study and twenty 'selected seedlings' from the progenies of each of the palms were taken for the study. After recording the measurable characters they were planted in a second nursery for planting later when they are 4 years old as per local practice. The palm characters and description of the palms were recorded and tree-wise yield of nuts is also being recorded.

3) *Manurial experiment and cultural-cum-manurial experiment:*

In the plots earmarked for these two experiments tree-wise yield of nuts was recorded as pre-treatment data. The scheduled treatments are to be given in 1959 as per the approved programme.

4) *Green Manure Trial:*

To fix up the best (yielding largest quantity of green matter) green manure crop five promising varieties, *Sesbania speciosa*, Pillipesara (*Phaseolus trilobus*), *Aschynomene americana*, *Calopogonium mucunoides* and *Crotalaria striata*, were compared with Sunn-hemp (*Crotalaria striata*) in a randomised replicated trial for 3 years. From three years' results, it is seen that Sunn-hemp was consistently the top yielder followed by *Sesbania speciosa*. Sunn-hemp recorded an acre yield of about 10,000 lb. and had a duration of 80 days, the shortest of all the varieties compared. The experiment is being continued with Sunn-hemp, *Sesbania speciosa* and *Crotalaria striata*.

5) *Inter-cropping trial:*

Turmeric, ginger, banana and dry paddy are the inter-crops commonly grown in coconut gardens. To study which of this is the most remunerative by giving the highest net return a trial was conducted in a randomised replicated layout for 3 years. The local cultural and manurial practices for the crops were adopted. Turmeric and banana proved the most remunerative, with a net return of Rs. 333 and Rs. 49 respectively. The trial is being continued with these two crops. The effect of the inter crop on coconut will be studied in the coming years.

6) *Rhinoceros beetle Control Trial:*

The efficacy of quarterly application of 5% BHC dust (mixed with equal quantity of sand) in preventing fresh beetle attack was tested on a field scale in single observation plots (treated and control). There was no appreciable difference in favour of the treatment. For layout of a comprehensive trial with important pesticides, as designed by the Director, Central Coconut Research Station, Kayangulam, two hundred palms were earmarked, and data on incidence of beetle attack and other particulars of the palms earmarked were collected and submitted.

7) *Multiplication of Gangabondam:*

As per the recommendation of the Indian Central Coconut Committee, Gangabondam (a semi dwarf commonly grown in East Godavari for tender nut purposes) was multiplied and distributed both in and outside the State including Bombay and Kerala States.

(Sd.) Oilseeds Specialist,  
Andhra Pradesh.

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## APPENDIX IX

### Secretary's Note

*Subject No. 20.* Proposal for raising the level of the wet land block at the Regional Coconut Research Station, Ambajipeta (Andhra Pradesh).

Attached to this note is a proposal forwarded by the Director of Agriculture, Andhra Pradesh, for raising the level of 16 acres of low-lying area at the Regional Coconut Research Station, Ambajipeta. The State Government have also approved of the proposal.

The extent of the station is 60.26 acres, of which an area of 41.28 acres is a bearing coconut plantation and the remaining area of 18.98 acres is a low-lying block. Due to variation in the age of the palms and the presence of several gaps in the existing plantation, it is stated that the plantation block is not suitable for conducting comprehensive manurial trials. It is, therefore, proposed to raise the level of the 16 acres of low-lying land and raise a new coconut plantation for conducting manurial experiments.

The proposal is estimated to involve an expenditure of Rs. 10,000 and it is proposed to be shared equally by the State Government and the Committee.

It is also proposed to utilise the low-lying area for raising paddy, pulses, etc., until the block is ready for planting coconut seedlings. As the raising of the land is reported to be possible only in summer, it could be done in the summer of 1960 only and till that time the cultivation of paddy, pulses etc., may be undertaken in that plot. This proposal involves an expenditure of Rs.3,610 and a receipt of Rs.5,510 per annum. The expenditure and receipts are proposed to be shared by the State Government and the Committee in the ratio of 50 : 50 and 60 : 40 respectively as in the case of the sanctioned scheme. On this basis, the Committee's share of expenditure and receipts for one year will be Rs. 1,805 and Rs. 2,204 respectively. In other words, the Committee will get a net gain of Rs. 399.



The Sub-Committee may now decide 1) whether it approves of the proposal to raise the level of the wet land block at a cost of Rs. 10,000 and whether it agrees that the Committee may share 50 per cent of the expenditure and 2) whether it approves of the proposal to raise subsidiary crops on the block till its level is raised and agrees to bear the expenditure and receipts on the basis of 50:50 and 60:40 as mentioned in the proposal.

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### Proposal of Director of Agriculture

From	To
Sri. Rai Prithvi Raj, B. Ag., Director of Agriculture, Andhra Pradesh, Hyderabad.	The Secretary to Government, Agriculture Department, Andhra Pradesh, Hyderabad.

*D. Dis. Research II (3) 377/57 dated 5-1-59.*

Sir,

Sub: Indian Central Coconut Committee-Coconut Research Station, Ambajipeta (Andhra Pradesh) – Raising the level of the wet land block for fresh plantations-Additional funds-requested.

The Regional Coconut Research Station, Ambajipeta (Andhra Pradesh) consists of an area of 60.26 acres comprising 41.28 acres of bearing area and 18.98 acres of wet land block intended for fresh planting. As per the technical programme of work, the wet land area is to be planted with about 3½ to 4 years old seedlings. Three hundred seedlings are also to be planted in this area for conducting progeny studies. Further manuring trials, agronomical trials etc., have also to be taken up to study the performance of the seedlings.

The wet land block is sloping in two directions and at the end of each slope there is a shallow area where water accumulates in the rainy seasons and there is no outlet for this water. Hence it is imperative to raise the level of this low-lying wet land block in the meanwhile, so as to provide satisfactory growth conditions by eliminating water logged condition. Employing a bulldozer, it is estimated to cost Rs. 10,000 for reclamation of this area, breaking clods, levelling, forming

bunds and laying out into fields etc. This work is to be taken up during next summer season. In the meanwhile instead of keeping the land fallow, it is advantageous to raise cultivation of remunerative crops like paddy, pulses etc., as already proposed in the Budget Estimates and cultivated during 1957-58 and 1958-59 (Vide this office letter No. D. Dis. Res. II-456/57 dated 30-10-57 to the Indian Central Coconut Committee, Ernakulam under copy to the State Government with reference to the Committee's letter No. F. 83(1)/53-Accts dated 6-8-57 and Government's letter No. 78642 B. III/58-3 Agriculture dated 30-9-57 respectively). The Secretary, Indian Central Coconut Committee, Ernakulam was also informed of these proposals during his visit to Hyderabad in October, 57 and he further suggested that even in this area we might raise some mounds to plant coconuts and cultivate paddy in between so that this serves as a demonstration to the local cultivators. By raising these remunerative crops, there is a net profit of about Rs. 2,000 per year and hence this may be continued pending the eventual reclamation in due course.

Since these two items of expenditure are not included in the original G. O. Ms. No. 855 F & A (of Govt. of Madras) dated 28-4-1951, the following additional funds are now required for the purpose:—

- |   |                |
|---|----------------|
| i) Raising the level of 16 acres of low-lying area by digging soil from the fallow areas of about 3 acres | Rs.<br>6,600   |
| ii) Breaking clods, levelling, forming bunds and layout into fields etc.                                  | 3,400          |
| iii) Raising cultivation of paddy etc., from 1957-58 until reclamation is over.                           | 3,610 per year |

The expenditure on the items shall be borne on 50:50 basis and receipts on account of cultivation of remunerative crops appropriated on 60:40 basis between



the State Government and the Indian Central Coconut Committee as per the ratio adopted in G. O. Ms. No. 855 F & A dated 28-4-51.

I am enclosing herewith necessary proposal together with financial implications and I request that Government may be pleased to communicate their approval on these proposals to the Indian Central Coconut Committee, Ernakulam. Since the 26th meeting is scheduled to be held from 14th to 17th January, 1959, I am forwarding the required number of copies of these proposals to the Committee for its consideration at its ensuing meetings. The Secretary, Indian Central Coconut Committee, Ernakulam is also informed that consideration of this proposal by the Committee will not commit the State Government for any expenditure or action until they approve of the same.

I request early orders in the matter.

(Sd.)

for Director of Agriculture.

Copy to the Secretary, Indian Central Coconut Committee, P. B. No. 27, Ernakulam.

I am sending herewith 125 copies of the proposal for sanction of additional funds for raising the level of wet land block and cultivating remunerative crops pending reclamation. I request you to kindly include this subject in the agenda for consideration by the Indian Central Coconut Committee at its ensuing meeting from 14th to 17th January, 1959.

In this connection, I am to state that consideration of this proposal by the Committee will not commit the State Government for any expenditure or action until they approve of the same.

Yours faithfully,

(Sd.)

for Director of Agriculture.

Copy communicated for information to the Oilseeds Specialist, Rajendranagar.

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## **Proposal for raising the level of Wet Land Block at the Coconut Research Station, Ambajipeta**

In the Second and Third Five-Year Plans the emphasis is greatly laid in increasing the production of coconuts in as short a period as possible. It has been conceded that one of the surest ways of achieving high production in short period is to regularly manure the coconut plants with adequate doses of N,  $P_2O_5$  and  $K_2O$ . The dosage of manure varies depending upon the soil and climatic conditions. This is one of the reasons why regional research stations are established and for the Coconut Research Station Ambajipeta, this is one of the important items in the programme of work. In order to determine the adequate dose of manure it is necessary to lay out a comprehensive manurial trial with N, P & K each at three levels and with a plot size of 16 trees. The layout has been fully approved by Dr. K. P. V. Menon, Director, Central Coconut Research Station, Kayangulam. For such an experiment an area of nearly 18 acres with regular plantations is required. This is at present not existing in the farm and hence it is necessary to systematically plant an area of 18-19 acres with coconut plants so as to make it fit for conducting the manurial trial envisaged above.

The existing lands at Ambajipeta Research Station are disposed of as follows:-

- 1) Total area of the farm ... 60.26 acres.
- 2) Total area of bearing plantation block ... 41.28 acres.
- 3) Total low lying area ... 18.98 acres.

Of the area under bearing plantation about 7 acres consist of uneconomic palms; hence earmarked for inter-planting 300 seedlings for plantation performance study. In the rest of the bearing area the following experiments are scheduled to be laid out as per the programme of work.

- 1) Fertiliser placement trial.
- 2) Inter-cultivation trial.

- 3) Rhinoceros beetle control trial.
- 4) Green manure trial.
- 5) Inter-cropping trial.

Further the present plantation area consists of plants with wide variation in the age, growth and with several gaps and hence is not suited for conducting the comprehensive manurial trial as envisaged above.

It is, therefore, necessary to plant an area of 18 to 19 acres with fresh seedlings in a systematic way so that a manurial experiment could be taken up in due course. The only area that could be utilised for this purpose is a wet land block of 19 acres mentioned above, but this area being low lying is subject to water stagnation and hence not suitable for coconut cultivation. It is, therefore, necessary to raise the level of this land in order to eliminate the water logging and thus make the land fit for coconut cultivation. Raising coconut seedlings on small mounds in this area is not feasible as it is not a local practice.

*Method of raising the level of the land:*

a) The wet land block is sloping in two directions and at the end of each slope there is a sallow area where water accumulates in the rainy season and there is no outlet for this water. Hence it is necessary to raise the level of the 16 acres of the land by digging the soil from these sallow areas of about 3 acres.

Employing a bulldozer, it is estimated (by the Agricultural Engineering Supervisor, Kakinada) to cost Rs. 10,000 as detailed in the estimates accompanying.

As the planting is to be done in 1959, the levelling up by bulldozing has to be taken up during the next summer. Otherwise it will not be possible for the soil to settle down and the land become ready for planting in 1959.

For effective utilisation of the land during these two years, it has been proposed to raise paddy and pulses etc. Expenditure required for this has been included in



the Budget estimates sent to the Committee. Revised Budget estimates for 1957-58 and Budget estimates for 1958-59 were already submitted in this office D. Dis. Res. II. 456-57 dated 31-10-57 to the Indian Central Coconut Committee and copied to the State Government with reference to the Committee's letter No. F. 83 (1)/53 Accts. dated 6-8-57 and Government's letter No. 78642 B. III 57-3 Agriculture dated 30-9-57.

*Financial estimates:*

Details of the cost of the proposal are submitted in the Appendix. The funds required are to be sanctioned by additional appropriation as there are no savings available for re-appropriation as there are no savings available for re-appropriation. The expenditure on these items shall be borne on 50:50 basis and receipts on account of cultivation of remunerative crops appropriated on 60:40 basis between the State Government and the Indian Central Coconut Committee as per the ratio adopted in G. O. Ms. No. 855 F & A dated 28-4-51.

(Sd) for Director of Agriculture.

## APPENDIX

Estimates of expenditure and receipts for raising the level of the wet land block at the Coconut Research Station, Ambajipeta.

S. No.	Particulars	Amount
I.	Cost of reclamation work.	Rs.
1)	Raising level of 16 acres of wet land with the earth removed from 3 acres by bulldozing.	6,600
2)	Breaking clods, levelling, forming bunds and layout into fields etc.,	3,400
	Total	Rs. 10,000



II. *Raising remunerative crops.*

	1957-58	1958-59	*1959-60	Total
1) Raising paddy in 19 acres at Rs. 150 per acre.	2,850	2,850	2,850	8,550
2) Raising pulses in 4 acres at Rs. 40 per acre.	160	160	160	480
3) Raising sunnhemp green manure-cum-fodder in 15 acres at Rs. 40 per acre.	600	600	600	1,800
Total Rs.	3,610	3,610	3,610	10,830

III. *Receipts.*

1) Value of 190 bags of paddy in the 1 year and 210 bags in the 2nd year at Rs. 23 per bag.	4,370	4,830	4,370	13,570
2) Value of pulses crop 4 acres at Rs. 60 per acre.	240	240	240	720
3) Value of sunnhemp 15 acres at Rs. 60.	900	900	900	2,700
Total receipts.	5,510	5,970	5,510	16,990

\* As the additional funds are required to be approved by the Indian Central Coconut Committee during its ensuing meeting and as it will take considerable time for the State Government to sanction the expenditure for undertaking the reclamation work it is necessary to raise the cultivation of remunerative crops during 1959-60 also, instead of keeping the land fallow.

## APPENDIX X

### Secretary's Note

#### EXTENSION SCHEME

Subject No. 22. Regional Coconut Research Station  
Bhatye, Ratnagiri District, Bombay  
State - proposal for the extension of

- |  |   |
|--|---|
| 1. Name of the Scheme                        | Regional Coconut Research Station scheme in Bombay State  |
| 2. Location                                  | Bhatye, Ratnagiri District  |
| 3. Object of the Scheme                      | To tackle the problems of the tract relating to marketing, cultivation and other agronomic aspects of coconut cultivation.  |
| 4. Date of commencement of the scheme        | 1-7-1955.   |
| 5. Date of termination of the present scheme | 30-6-1960.  |
| 6. Results achieved in brief                 | Preliminary work consisting of levelling and terracing of land and planting of coconut trees along the coast to create wind-break has been done. Layout of the manual and cultural trials was completed in 1955. The results from these trials are expected to be available a few years hence. Preliminary data regarding growth and vegetative characters of the palms have been gathered. |
| 7. Reasons for the extension                 | The work of the Station is now only in its preliminary  |

	stage and it is essential that it should be continued for a few more years to achieve conclusive results.	
Duration of the extension	5 years 9 months (1-7-1960 to 31-3-1966) to make it co-terminous with the III Five-Year Plan.	
Cost of the extension under the following heads		
a. Expenditure		
Non-recurring		Rs. 40,000.
Recurring		Rs. 1,90,520.
Share of the Committee	}	Rs. 95,260 (50% of the recurring expenditure)
Share of the State Government		Rs. 1,35,260 (50% of the recurring expenditure and the entire non-recurring expenditure)
b. Receipts		Rs. 8,200
Share of the Committee (50%)	}	Rs. 4,100
Share of the State Government (50%)		Rs. 4,100
c. Net cost		Rs. 2,22,320
Share of the Committee		Rs. 91,160
Share of the State Government	}	Rs. 1,31,160
0. Remarks of the Secretariat on the proposal	1) The present proposal has been forwarded by the Director of Agriculture, Bombay State. The State Government have not yet communicated their approval of the proposal.	



2) The cultural and manual programmes have been drawn up in accordance with the recommendation of the Manual Trials Sub-Committee constituted by the Committee some time ago. It is also proposed to take up hybridisation work during the extension period. To deal with the additional work that would result in the implementation of the amplified programme of work, it is proposed to appoint additional staff consisting of a Class I Officer in the scale of Rs. 220-650, a Senior Clerk on Rs. 100-140, a Mali on Rs. 35-45 and a Peon on Rs. 30-35.

It may be recalled that the Committee at its last meeting had decided that production of hybrid seedlings on a large scale should be taken up at the Regional Coconut Research Stations. While communicating the decision to the State Governments they were informed that arrangements could be made to give the workers of the Regional Coconut Research Stations necessary training in hybridisation work at the Central Coconut Research Station, Kasaragod. If the Agricultural Officer already appointed under the scheme

is not experienced in hybridisation work, arrangements can be made to give him the training at Katara-god. It may not then be necessary to appoint a Class II Officer. The other additional staff suggested also appear to be superfluous.

3) The recurring expenditure and receipts are proposed to be shared in the ratio of 50:50. The station will complete 10 years of its operation on 30-6-1965 and according to the General Conditions Applicable to Grants made by the Indian Central Coconut Committee, the Committee's share of expenditure beyond the 10th year has to be limited to 33½%. Receipts from the scheme have to be shared in the same proportion in which the expenditure is shared.

4) The Committee's share of expenditure and receipts according to the proposal are estimated at Rs. 95,260 and Rs. 4,100 respectively. The net expenditure will thus be Rs. 91,160. If, however, the suggestions made in comments Nos. (2) and (3) are accepted, the Committee's share of recurring expenditure and receipts will be Rs. 70,426 and Rs. 3,162 respectively. The net expenditure to the Committee will thus be Rs. 67,264.

The Committee may now decide whether they would approve of the proposal for the extension of the scheme 5 years and 9 months from 1-7-1960 subject to the Secretariat remarks.

The subject may first be considered by the Agricultural Research and Development Sub-Committee (Research Wing).

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Proforma for submission of proposals for the continuance of current research schemes to the Indian Central Coconut Committee.

- |  |  |
|--|--|
| 1. Name of the scheme with location:   | Scheme for the Establishment of the Regional Coconut Research Station at Ratnagiri, located on the sea face of village Bhatye in Ratnagiri District of Bombay State. |
| 2. Date of starting of the scheme:   | 1st July, 1955.  |
| 3. Date of termination of the present sanction:                                    | 30th June, 1960.   |
| 4. Expenditure anticipated till termination of the present period of the scheme.   | Rs. 2,55,316.  |
| 5. A brief summary of the results achieved so far and their economic implications. | (as below)   |

The scheme for the Establishment of the Regional Coconut Research Station in Ratnagiri District started



from 1-7-1955 after taking possession of the land measuring 69 acres. The preliminary work consisted of leveling, terracing the land and planting casuarina along the sea coast to make a protective wind-break. Temporary fencing on the eastern side was erected as prerequisite before planting the experimental plot. The planting material was prepared and layout of the following trials:

(1) manurial, and (2) cultural trials,

have been completed in the year 1958. The results from these trials would be available after a few years. The preliminary data regarding growth of palms vegetative characters of the palms are being observed, and would take a few years more to arrive at conclusive results. Since the scheme has completed only preliminary stage it is essential that the work of regional research station be continued during the III and IV Five-Year Plans in order to achieve full results.

6. Further work remaining to be investigated including the economic implications of the results likely to be achieved through the scheme.

- (i) The cultural and manurial trials started now would be continued during the extension period.
- (ii) The progeny row trial from marked mother trees would be undertaken.
- (iii) Hybridisation (T X D) varieties of coconut. Pollen to be obtained from high yielding mother palms from the Central Coconut Research Station, Kasargod.

7. Technical programme or Technique.

The following items of work are to be carried out:

1. Progeny row trials. These would be laid out as per suggestion of Statistical Adviser, I. C. A. R., letter

No. F. 83(1)/58 dated 1-10-58 of the Secretary, I. C. C. Committee.

2. Renovation of the existing old coconut palms with a regular programme of green manuring and application of N. P. K. dose.
3. Cultural trial - Eight selected treatments randomised on an area of 10 acres and replicated 6 times will be continued.

- 1)  $N_0$  No cultivation.
- 2)  $P_1$  Ploughing once a year in October.
- 3)  $P_2$  Ploughing in October and April.
- 4)  $P_3$  Ploughing in October, April & June.
- 5)  $D_1$  Digging inter-spaces in October.
- 6)  $D_2$  Digging inter-spaces in October & April.
- 7)  $D_3$  Digging inter-spaces in Oct., Apr., & June.
- 8) C Clean cultivation.

4. Manurial trial - An experiment on N. P. K. series at three different levels with compost as basal dose for all the treatments is to be continued. The item of green manuring as against no green manuring is also included making in all 27 treatments distributed in all on 18 acres. The experiment is started on one year old palms with the following doses, on the lines suggested by the Manurial Trials Sub-Committee. These doses will be increased year by year as suggested by the Sub-Committee.

- $N_0$  No Nitrogen.
- $N_1$  0-10 lbs. nitrogen.
- $N_2$  0-20 lbs. nitrogen.
- $P_0$  No phosphoric acid.
- $P_1$  0.10 lb. phosphoric acid.
- $P_2$  0.20 lb. phosphoric acid.
- $K_0$  No potash.
- $K_1$  0.10 lbs. Potash.
- $K_2$  0.20 lbs. Potash.

5. *Varietal trial* - This trial of exotic varieties would be continued with additions as secured from different States.

6. Survey of coconut growing areas to be continued with a view to mark suitable high yielding mother trees grown under rainfed conditions and to utilise such nuts for progeny studies.
7. Period for which the extension is sought. For 5 years and 9 months i.e. from 1-7-1960 to 31-3-1966 in order to make it coterminus with the III Five-Year Plan.

8. Recurring expenditure. As per statement enclosed.

The additional staff of one B. A. S. Class II Officer and one Senior Clerk has been provided looking into the additional work and responsibilities in the extension period. The work on various phases of coconut research will have to be intensified and in addition the existing cultural, manual and varietal experiments will have to be continued. In addition the programme of hybridisation in coconut is under contemplation. Since all this work is of a responsible nature it is quite essential that the Station should be managed by a responsible officer in a gazetted cadre.

9. Receipts anticipated. Rs. 8,200 : details as per statement enclosed.
10. Share of Indian Central Coconut Committee in the expenditure. Half i. e. 50% of the recurring expenditure i. e. Rs. 95,260.



11. Share of the I.C.C.C. 50% of the anticipated receipts i. e. Rs. 4,100.  
in receipts.

12. Certified that:

- (a) The scale of pay and allowances etc., proposed above are those admissible to persons of corresponding status employed under the State Government.
- (b) The present scheme cannot be combined with any scheme
  - (i) financed entirely by the State Government
  - (ii) financed by or submitted to any other Commodity Committees or the Indian Council of Agricultural Research.
- (c) Necessary provision for the scheme will be made in the State Budget in anticipation of the sanction of the scheme by the Indian Central Coconut Committee.

(Sd.) Horticulturist,  
Agricultural Department,  
Bombay State, Poona-5.

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## Extension Proposal for the Scheme for the Establishment of Coconut Research Station, Ratnagiri, for the III – Five Year Plan.

| Sl. No.              | Particulars                                                    | 1960-61<br>(1-7-60 to 31-3-1961)<br>8 months provision |       |       |       |       | 1961-62 | 1962-63 | 1963-64 | 1964-65 | 1965-66 | Total      |
|----------------------|----------------------------------------------------------------|--------------------------------------------------------|-------|-------|-------|-------|---------|---------|---------|---------|---------|------------|
|                      |                                                                | (3)                                                    | (4)   | (5)   | (6)   | (7)   |         |         |         |         |         |            |
| (1)                  | (2)                                                            |                                                        |       |       |       |       |         |         |         |         |         |            |
| I. Non-recurring     |                                                                |                                                        |       |       |       |       |         |         |         |         |         |            |
| 1.                   | Construction of Residential Quarters                           | Rs. 30,000                                             | Rs. — | Rs. — | Rs. — | Rs. — | Rs. —   | Rs. —   | Rs. —   | Rs. —   | Rs. —   | Rs. 30,000 |
| 2.                   | Equipments, microscope, dissecting and Binocular research type | 10,000                                                 | —     | —     | —     | —     | —       | —       | —       | —       | —       | 10,000     |
|                      | Total Non-recurring                                            | 40,000                                                 | —     | —     | —     | —     | —       | —       | —       | —       | —       | 40,000     |
| II. Recurring        |                                                                |                                                        |       |       |       |       |         |         |         |         |         |            |
|                      | Pay of officer—one B.A.S. Class II, Rs. 220-15-400-EB-20-650.  | 1760                                                   | 2760  | 2940  | 3120  | 3300  | 3480    | 3300    | 3480    | 3300    | 3480    | 17,360     |
|                      | Total Pay of Officer                                           | 1760                                                   | 2760  | 2940  | 3120  | 3300  | 3480    | 3300    | 3480    | 3300    | 3480    | 17,360     |
| Pay of Establishment |                                                                |                                                        |       |       |       |       |         |         |         |         |         |            |
| 1.                   | One Agril. Officer, I grade, Rs. 210-10-300                    | 1680                                                   | 2600  | 2720  | 2840  | 2960  | 3080    | 2960    | 3080    | 2960    | 3080    | 15,880     |
| 2.                   | Two Agril. Asstts, II grade, Rs. 55-3-85-EB-4-125-5-140        | 880                                                    | 1368  | 1440  | 1512  | 1584  | 1656    | 1584    | 1656    | 1584    | 1656    | 8,440      |

| (1) | (2)                                          | (3)        | (4)        | (5)        | (6)        | (7)        | (8)        | (9)          |
|-----|----------------------------------------------|------------|------------|------------|------------|------------|------------|--------------|
| 3.  | One Agril. Asstt. III grade<br>Rs. 55-3-85   | Rs.<br>440 | Rs.<br>684 | Rs.<br>720 | Rs.<br>756 | Rs.<br>792 | Rs.<br>828 | Rs.<br>4,220 |
| 4.  | Two Malis - Rs. 35-1-45                      | 560        | 856        | 880        | 904        | 928        | 952        | 5,080        |
| 5.  | One Sr. Clerk Rs. 100-8-140.                 | 800        | 1264       | 1360       | 1456       | 1552       | 1648       | 8,080        |
| 6.  | One Jr. Clerk Rs. 55-3-85-<br>EB-4-125-5-130 | 440        | 684        | 720        | 756        | 792        | 828        | 4,220        |
| 7.  | Two Watchmen Rs. 30- $\frac{1}{2}$ -35       | 480        | 728        | 740        | 752        | 764        | 776        | 4,240        |
| 8.  | Two Peons Rs. 30- $\frac{1}{2}$ -35          | 480        | 728        | 740        | 752        | 764        | 776        | 4,240        |
|     | Total Pay of Establishment                   | 5760       | 8912       | 9320       | 9728       | 10,136     | 10,544     | 54,400       |
|     | <i>Dearness Allowance</i>                    |            |            |            |            |            |            |              |
| 1.  | One B.A.S. II at Rs. 60                      | 480        | 720        | 720        | 720        | 720        | 720        | 4,080        |
| 2.  | One Agril. Officer I grade<br>at Rs. 60      | 480        | 720        | 720        | 720        | 720        | 720        | 4,080        |
| 3.  | Two Agril. Asstt. - II grade<br>at Rs. 45    | 720        | 1080       | 1080       | 1080       | 1080       | 1080       | 6,120        |
| 4.  | One Agril. Asstt. - III grade<br>at Rs. 45   | 360        | 540        | 540        | 540        | 540        | 540        | 3,060        |
| 5.  | Two Malis at Rs. 40                          | 640        | 960        | 960        | 960        | 960        | 960        | 5,440        |
| 6.  | One Sr. Clerk Rs. 45, 50                     | 360        | 580        | 600        | 600        | 600        | 600        | 3,340        |
| 7.  | One Jr. Clerk Rs. 45                         | 360        | 540        | 540        | 540        | 540        | 540        | 3,060        |
| 8.  | Two Watchmen at Rs. 40                       | 640        | 960        | 960        | 960        | 960        | 960        | 5,440        |
| 9.  | Two Peons at Rs. 40                          | 640        | 960        | 960        | 960        | 960        | 960        | 5,440        |
|     | Total Dearness Allowance                     | 4680       | 7060       | 7080       | 7080       | 7080       | 7080       | 40,060       |



|                                |        |        |        |        |        |        |                |
|--------------------------------|--------|--------|--------|--------|--------|--------|----------------|
| Travelling Allowance           | 750    | 1,000  | 1,000  | 1,000  | 1,000  | 1,000  | 5,750          |
| Total Travelling Allowance     | 750    | 1,000  | 1,000  | 1,000  | 1,000  | 1,000  | 5,750          |
| Total Allow. & Honoraria       | 5430   | 8060   | 8080   | 8080   | 8080   | 8080   | 45,810         |
| Contingencies.                 |        |        |        |        |        |        |                |
| Office exp. & Misl.            | 500    | 900    | 900    | 900    | 900    | 900    | 5,000          |
| Labour, water supply etc       | 6,000  | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 56,000         |
| Petty constr. & repairs        | 50     | 300    | 300    | 300    | 300    | 300    | 1,550          |
| Purchase, repairs, L/S,D/s     | 1,400  | 1,800  | 1,800  | 1,800  | 1,800  | 1,800  | 10,400         |
| Total contingencies            | 7950   | 13,000 | 13,000 | 13,000 | 13,000 | 13,000 | 72,950         |
| Total Recurrent                | 20,900 | 32,732 | 33,340 | 33,928 | 34,516 | 35,104 | 190,520        |
| Total Non-Recurrent            | 40,000 |        |        |        |        |        | 40,000         |
| Grand total:                   | 60,900 | 32,732 | 33,340 | 33,928 | 34,516 | 35,104 | 230,520        |
| Share of B'bay Govt. 50%       | —      | —      | —      | —      | —      | —      | 135,260        |
| (Recurrent plus Non-recurring) |        |        |        |        |        |        | 95,260         |
| Share of I. C. C. C.           |        |        |        |        |        |        | <u>230,520</u> |

Receipts  
Total Receipts  
Receipts to be shared between  
State Govt. & I.C.C.C. on 50:  
50 basis

State Government  
I. C. C. Committee

4,100  
4,100

(Sd.) Horticulturist,  
Department of Agriculture, B. S., Poona-5.

## APPENDIX XI

### Secretary's Note

*Subject No. 23.* Regional Coconut Research Station, Ratnagiri, Bombay State - Review of work done at.

The Deputy Director of Agriculture, Bombay State, has suggested that the work so far done at the Regional Coconut Research Station, Ratnagiri, may be reviewed. A note on the work so far done at the station, forwarded by him, is attached.

According to item 20 of the "General Conditions applicable to grants made by the Committee", the work of the Regional Coconut Research Stations financed by the Committee has to be reviewed at the end of the 3rd, 5th and 8th year. Although the scheme under which the Regional Coconut Research Station, Ratnagiri, has been set up started functioning in July, 1955, cultural and manurial experiments were started only in 1957.

In this connection it may be pointed out that the review of the work at the Regional Coconut Research Station, Ambajipeta (Andhra Pradesh) is overdue, the work under the scheme having started in 1956.

It is suggested that the Director and Joint Director of the Central Coconut Research Stations, Kayangulam and Kasaragod may undertake jointly the review of the work of the Regional Coconut Research Stations at Ratnagiri and Ambajipeta and that they may be authorized to undertake future reviews of the works of the research stations in different States when they are due according to the general conditions.

The subject may be considered first by the Agricultural Research and Development Sub-Committee (Research Wing).

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*Review of the research work done at the Regional Coconut Research Station, Ratnagiri.*

The Scheme for the establishment of a Regional Coconut Research Station, Ratnagiri has been started

from 1st July 1955 as per Government Resolution of Agriculture and Forests Department No. I. C. C. C. 1154 of 4th April 1955. Accordingly an area of 67 acres was selected for starting the Research Station at Bhatye near Ratnagiri. The experiments on coconut have been laid out in the years 1957 and 1958. As these experiments have been recently laid out and coconut palms require at least 7 years to come into bearing, results of these experiments will be available after a decade.

1. Coconut seedlings planted in 1957 were utilised for lay out of cultural experiments of ploughing and digging interspaces and clean cultivation. Record of observations is in progress.

2. Manurial experiment has been laid out as per recommendation of the manurial committee of Indian Central Coconut Committee. Observations of growth of palms are being recorded.

3. 25 seedlings of variety Gangabondam from Andhra State and some local types from Saurashtra have been added and order for seedlings of W. C. T. and T x D is already placed with Central Coconut Research Station at Kasaragod.

4. Nuts from the outstanding bearing trees marked previously have been collected and planted in the nursery for progeny row trials.

5. By systematic manuring yield of old coconut plantation of 205 trees closely spaced has been considerably increased.

6. Control of Rhinoceros beetle in the compost pit with 0.1 per cent B. H. C. insecticide has been done successfully.



## APPENDIX XII

### Secretary's Note

*Subject No. 28.* Scheme for the Investigation of the 'Band' disease of coconut and arecanut-  
Report of the Special Sub-Committee.

The Indian Central Coconut Committee at its last meeting held in January 1959, while considering the report of the Plant Physiologist, Central Coconut Research Station, Kayangulam on the working of the Band disease scheme on coconut had decided that the Special Sub-Committee consisting of Shri C. M. John, Dr. K. P. V. Menon, Shri S. S. Sirur (Agricultural Chemist, Government of Mysore) and Secretary, Indian Central Arecanut Committee appointed by the Indian Central Arecanut Committee to report on the future of the Band disease on arecanut be requested to make recommendations in respect of the Band disease of coconut also. As the present Band disease scheme on coconut worked by the Maharashtra Association for the Cultivation of Science was due to expire on 14-1-1960, the Committee had also decided that the report of the Special Sub-Committee should be considered at an early joint meeting of the Agricultural Research and Development Sub-Committee (Research Wing) of this Committee and the Agricultural Research Sub-Committee of the Indian Central Arecanut Committee.

The members of the Special Sub-Committee visited the 'Band' affected areas in Bombay State from the 10th to 19th March 1959 and have submitted a report covering the 'Band' disease of coconut and arecanut. A joint meeting of the research Sub-Committees of the two Committees as suggested above was proposed to be convened in September 1959 along with meetings of the Research and Development Wings of the Agricultural Research and Development Sub-Committee of this Committee. The Agricultural Commissioner with the Government of India, the proposed Chairman of the joint meeting, however, expressed his inability to attend the meeting in September 1959. Dr. B. P. Pal, Director,

Indian Agricultural Research Institute, Chairman of the Research Wing of the Agricultural Research and Development Sub-Committee also desired that the meeting be held in conjunction with the annual meeting of the Committee. The report of the Special Sub-Committee is, therefore, placed for the consideration of the Committee at this meeting.

Considering the various aspects of the problem, the Sub-Committee is of the view that an amplification of the investigations regarding coconut and arecanut is fully justified. They have felt that the work has to be carried out more systematically and thoroughly and that by combining the Band disease schemes on coconut and arecanut into a co-ordinated scheme, the work could be carried out more efficiently, and economically. Accordingly, they have drawn up a five-year scheme estimated to cost Rs. 2,82,848 and have suggested that the expenditure may be borne equally by the Indian Central Coconut Committee, the Indian Central Arecanut Committee and the Government of Bombay. For the sake of convenience the Sub-Committee has allocated the work to be carried out by the Maharashtra Association for the Cultivation of Science and the Government of Bombay. The Sub-Committee have also proposed that a technical Sub-Committee be set up to draw up the detailed technical programme and to review the work periodically.

The Committee may now decide whether they approve of the recommendations of the Special Sub-Committee and agree to meet an expenditure of Rs. 94,282.66 for a period of 5 years. They may also suggest what the constitution of the proposed Technical Sub-Committee may be.

The recommendations of the Committee will be placed for the consideration of the Indian Central Arecanut Committee also.

The subject may first be considered by the Agricultural Research and Development Sub-Committee (Research Wing).

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**Report of the Special Sub-Committee on the Scheme for the Investigation of Band disease of Arecanut and Coconut Palms conducted by the Department of Agriculture Bombay and the Maharashtra Association for the Cultivation of Science, Poona.**

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**Review of work done in the Schemes for the Investigation of the Band Disease of Arecanut and Coconut Palm in Bombay State.**

The Indian Central Arecanut Committee at its 10th Annual Meeting held at Trivandrum in January, 1959 appointed a Special Sub-Committee consisting of Shri C. M. John, Member, Indian Central Arecanut and Coconut Committees, Dr. K. P. V. Menon, Director, Central Coconut Research Station, Kayangulam and Co-opted member of the Indian Central Arecanut Committee, Shri S.S. Sirur, Agricultural Chemist, Government of Mysore, with the Secretary, Indian Central Arecanut Committee as Convener to review the progress of work in the schemes of investigations on the Band disease of arecanut run by the Department of Agriculture, Bombay State and the Maharashtra Association for the Cultivation of Science, Poona with financial aid from the Committee (Appendix I (a) ). The Indian Central Coconut Committee at its 26th Meeting held at Trivandrum subsequent to the Arecanut Committee meeting, decided that the above Sub-Committee appointed by the Indian Central Arecanut Committee may also be requested to make recommendations on the working and the future set up of the investigation on the Band disease of coconut palms carried out by the M. A. C. S. with financial aid from that Committee (Appendix I (b) ). These arose out of the fact that Band disease of arecanut and coconut occurred almost in the same tracts of Colaba and Ratnagiri Districts of Bombay State and also the same organisations were concerned with the investigations.

The members of the Sub-Committee, excepting Shri S. S. Sirur, who regretted his inability to work with the Sub-Committee, visited the important arecanut and



coconut growing areas in the coastal tracts of Colaba and Ratnagiri Districts viz., Janjira-Murud, Shrivardhan, Anjarle-Murudi, Dapoli and Dabhol so as to acquaint themselves with the prevailing problems and see the field investigations that were in progress. They were accompanied by Dr. H. G. Pandya, Agricultural Chemist, Bombay, Dr. S. G. Joshi, Agricultural Officer, Coconut Scheme and Dr. S. G. Kulkarni, Bio-Chemist, Arecanut Scheme of the M.A.C.S. and some of the staff members working in the Schemes. The Sub-Committee also visited the laboratories of the Agricultural Chemist and the M.A.C.S. at Poona.

The Sub-Committee was on tour in Bombay State from the 10th to the 19th March 1959.

Since the *Band* diseases of arecanut and coconut occur under identical conditions in the same coastal tracts of Ratnagiri and Colaba Districts of Bombay State and the investigations carried out are more or less on similar lines, the Sub-Committee thought it appropriate to combine its observations and remarks on the two investigations into one report, so as to avoid unnecessary repetition and duplication of efforts. The Sub-Committee was also led to adopt this procedure as a combination of the investigation of the *Band* disease of arecanuts and coconuts which are grown in association, into a single co-ordinated comprehensive scheme would lead to efficiency and economy in execution. The Sub-Committee has however, endeavoured to treat the different investigations separately as Parts I and II of the report. The programme of future work, staff structure, financial implications etc., are also dealt with in separate parts.

The Sub-committee was greatly helped in its deliberations by Dr. N. Narayana, Ex—Agricultural Chemist and Dr. M. M. Kibe, Soil Specialist, Bombay State and Prof. S. P. Agharkar and Dr. G. B. Deogrikar of the M. A. C. S.

Before proceeding with the report, the Sub-Committee wishes to place on record its grateful thanks to Dr. H. G. Pandya, Dr. S. G. Joshi and S. G. Kulkarni and

other staff members who toured with it and rendered all facilities for carrying out its work. The Sub-Committee would also like to thank the Director of Agriculture, Bombay State and the Director, M. A. C. S. for deputing the above-mentioned officers for this purpose.

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## PART I.

### Review of work done on band disease of arecanut

The Bombay State has now a total area of 5,790 acres under arecanut. This area lies concentrated in the coastal tracts of Ratnagiri and Colaba Districts. Arecanuts and coconuts are the only cash crops of the farmers in this area. The holdings are very small and only in very rare cases, they exceed an acre in extent. In fact gardens have been established in areas levelled, terraced and filled up with transported soil at considerable cost. The farmers entirely depend upon the income from these crops for their subsistence.

The *Band* disease of arecanut has been in existence in these tracts for over eighty years and has caused considerable reduction in the vitality and yield of palms. The disease occurs from the young age of about three years to the adult and advanced age. It arrests growth, with reduced leaf-size and production resulting in the death of the palm in a spectacularly short period of time. The severity of the disease was more in evidence in the gardens of the small farmers who were not in a position to adopt regular cultivation operations such as controlled irrigation, manuring, interculturing etc. Being the only crop which affords them some income, most of the farmers are inclined to overcrowd their gardens by resorting to indiscriminate and intensive under-planting. Some of the farmers whom the Sub-Committee had the privilege of meeting during the course of the tour, felt almost helpless to overcome the situation and pleaded that every effort should be made to evolve practical and effective remedial measures by the quickest possible time.



It may also be mentioned in this connection that the variety of arecanut grown in this tract viz., "Shrivardhan Rotha" is considered to be the best quality of arecanut in India and is greatly in demand and therefore fetches the highest price. The reduction in production of this variety will certainly upset the economy of the people of this tract as they depend almost entirely on this crop for their maintenance and deprive the consumers a quality they like most.

### The Schemes

*Band* disease of arecanuts was under investigation from very early times by the Department of Agriculture, Bombay State. The M. A. C. S. which was established in 1946 under the Directorship of Prof. Agharkar, also took up the investigation on this disease at Murudi and Anjarle under the guidance of Prof. N. V. Joshi in 1949. The Department of Agriculture, Bombay State and the M. A. C. S. are running two schemes from 1953 and 1954 respectively with financial aid from the Indian Central Arecanut Committee. A summary review of the work done under these two agencies is give hereunder.

#### A. Scheme under the Department of Agriculture, Bombay State

##### (a) *Details of sanction etc.*

|                                           | Total expenses    | Share of I. C. A. C. |
|-------------------------------------------|-------------------|----------------------|
| Five-year scheme from 1-6-1953            | Rs. 77,600        | Rs. 38,800           |
| Extension scheme for three years          | Rs. 57,728        | Rs. 28,864           |
| Date of expiry of the<br>Extension Scheme | 31st March, 1961. |                      |

##### (b) *Object of the scheme.*

The object of the scheme is to investigate the causes and find out remedial measures for the *Band* disease of arecanut by improved methods of cultivation and manuring with macro and micro nutrients since no fungus or insect incidence was found to be responsible in earlier investigations. A detailed study regarding soil, plant and their inter-relationship was contemplated. The work done under each of the items of the approved technical programme is given below:-



(c) *Staff.*

The staff sanctioned for the scheme is as given below:-

|                      |                                        |
|----------------------|----------------------------------------|
| Officer-in-charge    | (1) Rs.220-15-400-EB-20-500-EB-25-650. |
| Analytical Chemist   | (1) Rs. 80-5-100-8-140-EB-10-200       |
| Laboratory Assistant | (1) Rs. 55-3-85-EB-4-125-5-140         |
| Senior Clerk         | (1) Rs. 100-8-140                      |
| Field Assistant      | (1) Rs. 55-3-85-EB-4-125-5-140         |
| Laboratory Hammals   | (2) Rs. 30- $\frac{1}{2}$ -35          |
| Peon                 | (1) Rs. 30- $\frac{1}{2}$ -35          |

It is unfortunate that the Officer-in-charge of the scheme functioned only for about eleven months, the post having remained vacant for the rest of the period.

(d) *Review of work.*

1. *Survey of arecanut cultivation in Colaba and Ratnagiri Districts as regards methods of cultivation, soils, disease etc.*

A reconnaissance survey undertaken revealed that most of the *Band* affected soils were situated on the coastal belt where the crop was grown continuously for the last two centuries or so, while the gardens on the hill slopes were free from the diseases. The affected gardens were very old, badly managed and with heavy undergrowth of various kinds of plants and with areca seedlings planted at close spacing. The gardens were irrigated by Persian wheel every second or third day, and in the summer daily.

2. *To examine the previous findings regarding manganese toxicity by carrying out the analysis of soils and plant samples from healthy and affected gardens.*

The analysis of soil samples, two each from healthy and diseased gardens, showed no striking difference in total and available manganese, which were on the high side. On the other hand, the plant analysis showed a high accumulation of manganese in the *Band* affected leaves and growing point as compared to that in the normal leaves of the affected plant and on all the leaves of the healthy plant.

3. *The effect of lime and moisture on the availability of manganese.*

It was found that an increase in the moisture content in the soil increased the availability of manganese in the soil. The addition of lime improved drainage and thereby decreased the availability of manganese and behaved as an antidote against possible manganese toxicity.

4. *Tissue analysis for the other nutrients.*

Analysis of the leaves for plant nutrients other than manganese showed no significant difference between the healthy and diseased plant.

5. *Field trials.*

Eight feeler trials were laid out in 1954-55 in 27 private gardens in Colaba and Ratnagiri Districts on 280 *Band* affected palms to see the effect of general manuring with N, P, K, lime, Cu, and Zn. The source of N, P, & K, were compost, groundnut cake, superphosphate and ash. Periodical observations were taken on the experimental palms. No conclusions appear to have been drawn from these trials.

In 1955-56 the feeler trials were modified and were laid out on 1000 disease-affected palms in five villages. The revised treatments included 1 lb. of N, P, K, mixture in the form of chemical fertilizers supplying 75:30:75 lbs. N.,  $P_2O_5$  and  $K_2O$  per acre and micronutrients supplied both to the soils and as foliar spray in certain doses. These were continued in 1956-57. Observations made on the disease-affected palms showed that Mn and Cu sprays brought about some improvement in well managed gardens. In the other gardens palms receiving sprays of  $Zn\ SO_4$ , sodium borate and addition of fresh soil brought about some improvement. It was generally observed that nutrient application associated with clean cultivation and controlled irrigation gave better response.

In 1957-58 regular experiments with macro and micro nutrients were laid out in consultation with the State Statistician. Fourteen select treatments based on the



results of the feeler trials were adopted. 70 trials were laid out. This experiment is now in progress and six monthly observations are being taken.

Along with these trials, 20 palms in a separate patch were treated with 1 lb. N. P. K. mixture plus one mixed micronutrient spray. These are under observation.

Apart from these trials two manurial trials by application of 1 lb. N, P, K, mixture (80:30:80) to all the palms in one garden at Murud and another at Diveagar were laid out for demonstration purposes. These are under observation.

#### *Demonstration garden.*

At Shrivardhan, the Department has acquired a garden of one acre where improved methods of cultivation such as spacing (8'×8'), ring method of irrigation at an interval of eight days, the application of manures in ring trenches (1 lb. N, P, K, mixture 80:30:80) per palm etc. are followed from 1956 onwards. During the last three years the yield has increased and they are looking healthy.

### **B. Scheme under the Maharashtra Association for the Cultivation of Science.**

#### *(a) Details of the scheme.*

As indicated already, the M. A. C. S., Poona had initiated some preliminary work on *Band* disease of arecanut before the constitution of the Indian Central Arecanut Committee. In 1953 they submitted a five-year scheme of research on the *Band* disease on coconut and arecanut at an estimated cost of Rs. 61,170. This was subsequently revised confining the work to arecanut alone at a cost of Rs. 16,368 for a period of three years. The Committee, however, sanctioned only a lump sum of Rs. 5,000 in the first instance for 1954-55 which was followed by a grant of Rs. 3,800 in 1955-56 and Rs. 10,000 in 1956-57. The period for which money was sanctioned for work expired on 31st May, 1958. The Indian Central Arecanut Committee at its 12th ordinary meeting held at Calicut in January, 1958 considered and approved the extension proposals of the M. A. C. S. for a further



period of three years. This is pending sanction with the Government of India. However, the M. A. C. S. has continued the work with the previously sanctioned staff anticipating sanction of funds, as any stoppage of work would seriously affect its continuity and the object of the scheme.

(b) *Object of the scheme.*

The object of the scheme is to investigate the causes of *Band* disease in the Anjarle-Murudi area of Ratnagiri District and find out remedial measures by soil and plant analysis of the healthy and affected palms for macro and micro nutrients, micro biological assay of soils around the roots of the healthy and diseased palms and by adopting soil treatments of micronutrients etc.

(c) *Staff.*

One Biochemist — Rs. 150-10-220 (with effect from 16-12-1954.)

(d) *Review of work.*

The work done under the different items of the approved technical programme is summarised below:—

1. *Botanical and anatomical study of healthy, diseased and recovered plant parts of areca palms.*

This work has not been taken up since the post of the Botanical Assistant provided in the scheme was not sanctioned. It is, however, proposed to be undertaken when the extension proposal which includes the provision for the appointment of a Botanical Assistant is sanctioned.

2. *Physiological studies.*

Preparatory work for starting physiological studies with the Warburg apparatus has been completed by standardising the methods. Work on the enzyme activity is proposed to be undertaken as soon as the extension proposals come into operation.

3. *Manurial trials.*

In 1954 a new field experiment was started with copper sulphate, boric acid, zinc sulphate, ferrous

sulphate and lime with the local method serving as control. Sixteen diseased areca palms in six different gardens in Murudi area were selected, one treatment being given in each garden. Each diseased palm received one ounce of the material by soil application around the roots every six months and this was continued for three years. Six monthly observations showed copper sulphate to give the best response in improving the condition of the palms viz., change in the colour and size of the leaf to normal condition and flowering in certain cases. Only about 50% of the palms receiving zinc sulphate and boric acid showed some improvement. The addition of ferrous sulphate and lime did not have any appreciable effect.

Along with these trials, sixteen healthy areca palms were treated with manganese sulphate to find out whether the addition of Mn would induce *Band* disease. The palms did not develop disease symptoms thereby indicating that manganese toxicity might not be the cause.

In April, 1958, a new field experiment was started at Murudi at the instance of the Agricultural Chemist for corroboration of the field experiments conducted by him in the infected areas of Colaba District. The treatment included copper sulphate, zinc sulphate, boric acid, alum, magnesium sulphate, N.P.K. and sodium sulphate. Manganese sulphate was also applied to healthy areca palms. Alum was included to see whether the change of pH caused by  $\text{SO}_4$  radical of copper sulphate was the cause of the improvement noted in the copper sulphate treatment. Magnesium sulphate was included to see its effect on the colour of leaves of the diseased and healthy palms since the development of the dark green colour in leaves is one of the earliest symptoms of the disease and magnesium is an important constituent of chlorophyll. The treatment N. P. K. was included to see whether the disease was due to the deficiency of the major nutrients. Only one observation has so far been taken and no appreciable change has been noted in the treated palms.

#### 4. *Chemical analysis of soils.*

Chemical analysis of 10 pairs of soils around the roots of the diseased and healthy areca palms were



carried out for the contents of N, P, K, Cu and Mn. No significant difference of these plant nutrients in the diseased and healthy soils was noted.

### 5. *Chemical analysis of leaves.*

Chemical analysis of leaves of the *Band* diseased, recovered and healthy areca palms were carried out for the contents of N, P, K, Cu and Mn. No significant differences in per cent contents of these nutrients were found in the diseased, recovered and healthy areca palms. However, the total contents of these elements were much higher in the cases of healthy and recovered palms due to the big size of the leaves than in the case of leaves of the diseased palm.

### 6. *Microbiological analysis of soils*

Microbiological analysis like the study of nitrification, carbondioxide evolution and bacterial numbers of soils around the roots of the diseased and healthy areca palms were carried out with a view to study the effect of the addition of the two micronutrients—copper and zinc—on the microbiological activities and to find out whether they have any relation with *Band* disease. The results of the microbiological analysis of soils show that there is only a slight difference in the bacterial activities between the soils collected from the diseased and healthy areca palms. A slightly higher rate of nitrification and carbon dioxide production and greater number of bacteria in the soils around the roots of the healthy areca palms were observed, than in the case of soil around the roots of the *Band* diseased palms. The microbiological activities were also found to be increased with the addition of copper sulphate and zinc sulphate in both the soils, slightly higher microbiological activities being observed in the case of zinc sulphate than in the case of copper sulphate.

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## PART II

### Investigations on the Band Disease of Coconut in Bombay State conducted by the M.A.C.S., Poona.

#### 1. *Introduction.*

Coconut is another important crop of the coastal belt of Colaba and Ratnagiri Districts of Bombay State. It is grown pure and mixed with arecanuts on border of the holdings or in compact blocks on the western side of fields facing sea fronts to serve as an effective wind-break for areca. The area under coconut in these two Districts is estimated at about 15,152 acres.

#### 2. *Symptoms of Band disease of coconut.*

The *Band* disease of coconut is said to be of recent origin. It generally occurs in gardens where coconuts and arecanuts are grown together and where the latter are suffering from the disease. The percentage of field infection is estimated in some cases to be as high as 20 per cent.

The earliest symptom of the disease is said to be the development of an intense green colour in the newly opened leaf. This leaf is smaller in size than its immediate predecessor; the leaflets present a jointed and fasciated appearance and are unable to open out easily as in the case of the normal leaves. The leaflets also develop a glabrous texture. The leaves that are put out after disease incidence are successively stunted in appearance and there is reduction both in the size and the number of leaves produced and also in the number of leaflets per leaf, so that a leaf of a diseased palm has larger space between leaflets than the normal leaf of a healthy tree. After disease incidence the spathes that open out contain fewer number of female flowers and generally the fruits do not set. The size of the stem at the crown is appreciably reduced and within the course of two or three years it dwindles into a pencil point having a few stunted leaves and practically no nuts. Subsequently the crown topples over leaving the headless stem. It is stated that in the early stages of infection

the root system is intact and healthy but in advanced cases of infection roots may get rotten. One significant feature of the *Band* disease is that the foliage does not develop any premature yellowing. Instead of that leaves assume an abnormally dark green colour. Necrosis of the leaves is also not noticed. The earliest age at which the *Band* occurs on coconut palms is said to be 6 years. The affected palms die within 3-4 years.

### 3. *Details of the scheme.*

A five-year scheme for the investigation of the *Band* disease of coconut in Bombay State was sanctioned by the Indian Central Coconut Committee at an estimated cost of Rs. 36,660. It came into operation on the 15th January, 1955 and is to terminate on the 14th January, 1960.

### 4. *Object.*

The object of the scheme is to investigate the causative factors of the *Band* disease of the coconut palm and to find out remedial measures for the same.

### 5. *Staff.*

The staff sanctioned for the scheme is as given below :—

| Designation           | Scale of pay.                                                                           |
|-----------------------|-----------------------------------------------------------------------------------------|
| Agricultural Officer. | Rs. 210-10-300 plus D. A. at Rs. 55/- p.m. plus Rs. 15/- H. R. & Rs.10 Comp. allowance. |
| Field Kamgar.         | Rs. 55-3-85 plus D. A. at Rs. 45/- p. m. plus Rs. 10/- H. R. & Rs. 5/- Comp. allowance. |

### 6. *Technical programme.*

#### (i) *Chemical analysis of soils.*

This consists in the chemical and spectrographic examination of the soil of diseased and healthy palms. Determinations will be made of N. P. K. content as well as micronutrients like manganese, copper, zinc and boron.

#### (ii) *Microbiological soil analysis.*

Microbiological analysis of the soil samples is also to be made with a view to find out any defect in the



microbiological activities in the soil which may be responsible for making plant nutrients in soil unavailable to the plants.

(iii) *Analysis of leaves.*

Chemical analysis of leaves of coconut palms affected with *Band* disease and also the leaves of healthy palms is to be undertaken.

(iv) *Field experiments.*

*Band* affected coconut palms are to be treated with micronutrients like copper, zinc, boron, manganese and molybdenum applied to the soil and their effect studied.

(v) *Pot culture experiments.*

Pot culture experiments will be conducted to find out whether deficiency of particular micronutrient could reproduce the disease symptoms.

6. *Investigations.*

(i) *Chemical analysis of soils.*

A large number of soil samples were collected from healthy and diseased palms and were analysed for N, P, K, manganese and copper. No significant difference was observed in the soils of healthy and diseased palms.

(ii) *Microbiological analysis of soils.*

The soils from healthy and diseased palms were examined for the number of bacterial colonies per unit weight of the soil, the quantity of carbon dioxide evolved per unit weight and their capacity to produce and accumulate nitrate. It was observed that carbon dioxide production, bacterial numbers and the rate of nitrification were in general significantly higher in soils from healthy trees than in the soils from infected palms.

(iii) *Analysis of leaves.*

The chemical analysis of leaves of *Band* affected and healthy palms was undertaken. They were examined for N, P, K, Cu and Mn. The results obtained so far show that the Cu and Mn content of leaves of the healthy palm were higher than those from the diseased palms.



(iv) *Field experiments.*

Field experiments have been started at Shrivardhan, Murudi, Anjarle, Ade and Padale. They consist in the soil application of boric acid, manganese sulphate, copper sulphate, zinc sulphate and also a mixture of the above mentioned micronutrients. A treatment of *Band* diseased coconut palms with N. P. K. was also included for comparative study. The experiment is in progress and the trees are kept under observation. Preliminary observations made showed that the addition of N, P, K and the mixture of micronutrients gave some favourable response in diseased trees. Manganese had no effect while the addition of copper sulphate, boric acid and zinc sulphate singly appeared to be beneficial to some extent.

(v) *Pot culture experiments.*

A pot culture experiment with coconut seedlings growing in quartzs and in glazed pots was started in 1955 to investigate whether *Band* disease could be reproduced under artificial conditions by deficiencies of micronutrients. It was observed that the best growth was obtained in seedlings receiving a double dose of copper, zinc and boron while the plants receiving single dose of Cu, Zn or boron only showed poor growth.

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## PART III

### Discussion

#### 1. *Soil studies.*

In reviewing the different items of work done in the scheme of the *Band* disease of arecanuts and coconuts the Sub-Committee felt that there is some incompleteness in carrying out the work; for example in the case of soil analysis it is seen that the number of samples taken from which conclusions have been drawn were not large or representative enough. The necessity, therefore, to take a larger number of samples representing the entire tract and at different depths is indicated. In the case of soil profiles also the number of profiles examined appear

to be rather too small. Since the arecanut and coconut palms have deep root systems, the profiles and soils have to be studied in relation to the health of palms and root penetration.

## 2. *Water analysis.*

Irrigation with water from wells plays a very important part in the cultivation schedule of arecanuts and coconuts. No attempt has been made to examine the irrigation water chemically. This should be done since irrigation water in some cases has been reported to be brackish. The water has to be examined for salt contents, conductivity etc.

## 3. *Plant analysis.*

In the case of arecanut, the drawing of leaf samples for chemical analysis does not appear to have been standardised. The analysis of the different parts, such as sheath, petiole, lamina, mid-rib of healthy and diseased leaves, different leaves in the crown of healthy and diseased palms, healthy and non-healthy leaves in the same palm etc., would be necessary to find out which leaf would give a representative value for purposes of valid comparison. A technique for this has, therefore, to be worked out in the first instance. In the case of coconuts, the sampling technique evolved at the Central Coconut Research Station, Kayangulam is being followed.

## 4. *Microbiological assay.*

In this case also the number of samples examined appear to be too few and scanty. The need, therefore, of studying a large number of representative samples is indicated.

## 5. *Chromatographic analysis.*

The observation made under item No. 4 (above) holds good for this aspect of the investigation also.

## 6. *Botanical aspects.*

A comparative study of the anatomy of the different parts of the palms is considered necessary. It is noted that no work on this aspect of the investigation has



been taken up so far. This is a very important part of the investigation and should be carried out.

## 7. *Soil treatment.*

### (a) *Macronutrients.*

In the case of application of nutrients to the soil a dosage of 80:30:80 N, P, K, per acre has been adopted. The basis for working out this schedule is not known. In the case of gardens which have been cultivated continuously with areca for decades together with overcrowding and having other crops also, a higher dose of N, P, K, may be necessary. Investigation, therefore, has to be made to study the exhaust of soils due to continuous areca growth, and on the basis of that the present dose may have to be revised. The method of application, broadcast viz., trench or basin, depth of application, and time of application of fertilisers etc., have to be determined for the tract so that the palms may make efficient use of the nutrients supplied.

### (b) *Micronutrients.*

In the soil application of micronutrients a more efficient method of application appears to be necessary as the doses used are in most cases very small. It may probably be advisable to dissolve the micronutrients in water and then spray them to the soil and forked in.

In soil treatments it was observed that only single palms have been taken up for treatment. It is possible that the adjoining palms which grow even within 3 ft. of the treated palms may vitiate the experiment due to root spread in treated gardens. It would be necessary to take a cluster of palms with the experimental palm in the centre and give soil treatment to entire group.

Single micronutrients have been applied to individual palms and nearly 14 treatments appear to have been tested. In view of the difficulty to get trees of uniform age, intensity of disease etc., for experimental purpose and the difficulty that will arise in interpreting the data due to other environmental factors which are beyond control, it is suggested that the micronutrients may be grouped into convenient and compatible lots and



applied along with NPK as basal dressing. The evaluation of the effect of the individual nutrients, macro and micro may be studied under controlled conditions, in pot culture. The pot culture studies may be restricted to arecanuts only.

#### 8. *Establishment of a field laboratory.*

The work at present is being carried out in the laboratories of the Agricultural Chemist and the M. A. C. S., Poona and field work in certain centres in Colaba and Ratnagiri Districts. Most of the superior staff are stationed at Poona. Since field investigation is a very important aspect of the scheme, constant visits to these areas would be desirable. At present communications are cut off during the S. W. Monsoon. Future field trials may, therefore, be laid out in convenient places which could be reached easily by road. For the efficient execution of the work, particularly pot culture studies, it is felt that a field laboratory is necessary. This centre should be easily accessible from Poona where the main analytical work is being done during all times of the year. Alibag has been suggested as a suitable centre, and a convenient site may be selected for this purpose by the Department of Agriculture.

The Sub-Committee would urge the necessity for a quick transport for use of the workers for moving between the laboratory at Poona and the field laboratory and the field investigation centres. The present modes of conveyance viz., steamer, State transport etc., are very inconvenient and time consuming. It would be very necessary, therefore, to provide the workers with a jeep and trailer.

## PART IV

### Programme for Further Investigation

It may be seen from the review of work and discussions detailed above that certain information about soil conditions, nutritional aspects, plant constitution and agronomic practices in connection with *Band* disease

of arecanuts and coconuts has been obtained during the period the schemes have been in operation. The main findings are that proper spacing of areca palms, control of the frequency of irrigation, adoption of regular manuring practices involving the application of compost or farm yard manure and NPK fertilisers and certain micro-nutrients such as copper, zinc etc., improve to some extent the diseased conditions of the palm. In some cases a relapse of the recovered palms has been noticed.

While there is no denying the fact that improved agricultural practices including the manuring of palms with macro and micro nutrients would improve the existing conditions, the Sub-Committee feel that the investigations on the various aspects of the disease should be carried out more thoroughly so as to find out the causes of the disease and to suggest practical remedial measures. The Sub-Committee would, therefore, strongly recommend the continuation of the investigations on a more thorough basis for a period of five years so as to obtain reliable data on the various aspects of the *Band* disease of the coconut and arecanut palms.

Although the *Band* disease was first noted only to a limited extent it is now reported to be spreading almost to the entire areca tracts of Colaba and Ratnagiri Districts. Arecanut gardens located in portions of the North Canara District now passed on to the Mysore State, are also reported to be affected by the *Band* disease. Since the coastal tracts are important in areca production and the economy of the farmers of the area depends almost entirely on this crop, concerted effort has to be made to check the menace before it assumes more serious proportions.

Closely associated with the *Band* of arecanut is a similar disease on coconut which are grown in association with areca palms. This disease which is also suspected to be brought about by nutritional deficiencies and unscientific plantation management, is being investigated more or less on lines similar to those carried out on the *Band* disease of arecanuts under a grant from the Indian Central Coconut Committee. Empirical field



trials have shown some favourable response to the application of copper and zinc to the soil. The etiology of the disease from the entomological, plant pathological and virological aspects has not been taken into account since the *Band* disease of arecanut which is considered to be similar to the *Band* of coconut has not been ascribed to be arising out of the above causes. The Sub-Committee feel that the investigation of the *Band* disease of arecanuts and coconuts could be worked efficiently and economically as a co-ordinated scheme in future.

During the course of the visit of the Sub-Committee to the coconut and arecanut areas of Colaba and Ratnagiri Districts it came across many infected areca palms which were heavily colonised by insects like the green bug, red mites, coccids etc. The crinkling of the leaves appeared to be similar to the crinkling of certain other species of plants subject to virus diseases. In a few cases, the basal portion of the stem showed some rotting which require examination from pathological point of view.

Considering the various aspects of the problem and the results so far obtained, a re-orientation in outlook and amplification of the investigation of the *Band* disease of arecanut and coconut appear fully warranted. The Sub-Committee would, therefore, suggest that the investigations as detailed hereunder may be carried out for a further period of five years.

1. *Disease survey.*

A survey to estimate the percentage of disease incidence of *Band* and other important diseases of arecanut and coconut in the Colaba and Ratnagiri Districts is necessary. This may appropriately be done in collaboration with the State Statistician who has on hand a co-ordinated scheme of survey of arecanuts and coconuts in Bombay State.

2. *Soil survey.*

A well planned out soil survey including the study of soil profiles may be undertaken in the Colaba and Ratnagiri Districts. Along with this survey an assessment



of the agronomic practices, health and general condition of the palms, root spread, yield etc., of the gardens concerned should be made by the staff employed under the scheme (Agronomy and Plant Protection Assistants).

### 3. *Soil analysis.*

Both mechanical and chemical analysis of the top and sub-soil must be carried out. In determining the depths at which soil samples are to be drawn will generally be governed by the root penetration of the two palms. This analysis may be done for the macro and important micro nutrients, pH, C/N ratio, ion exchange etc., according to the All India Soil Survey Scheme.

### 4. *Microbiological assay.*

Microbiological assay of soils at the pre and post-treatment period of nutrient application of diseased gardens and also of soils in healthy areas not affected by *Band* disease may be made for comparison.

### 5. *Study of the quality of irrigation water.*

Water from representative irrigation wells may be collected in midsummer and analysed for salts to see whether the quality of irrigation water has any bearing on *Band* disease. It would be desirable to draw samples of water from gardens wherefrom soil samples have also been drawn.

### 6. *Plant analysis.*

#### (a) *Sampling technique.*

Standardisation of sampling technique for drawing samples for plant analysis has to be done for areca. Chemical analysis of leaves and growing point has to be done for the uptake of NPK and micronutrients.

#### (b) *Chromatographic analysis.*

The chromatographic analysis of plant material for sugar and amino acids has to be undertaken.

#### (c) *Chlorophyll.*

A comparative study of the chlorophyll of healthy and diseased leaves may be done.

(d) *Enzymes.*

A well planned study on the enzyme activity occurring in the palms at different times and its relation to the *Band* diseases forms a very important aspect of this investigation.

7. (a) *Botanical study.*

*Anatomical study.*

Anatomical study of the crown including leaves and developing inflorescences to assess the changes that happen from healthy to diseased conditions of the palms may be made.

(b) *Root study.*

A study of the root system of areca and coconut palms particularly relating to the development, spread, recovery after injury, main feeding zones, healthy or diseased conditions of infected palms etc., has to be undertaken.

8. *Plant protection.*

(a) *Plant Pathology.*

Samples of infected material are to be collected from representative areas and examined mycologically for different organisms that may be present. The role of the organisms in the causation of the disease is to be determined by conducting infection experiments.

(b) *Entomology.*

A survey of the insects colonising *Band* affected palms has to be made and the insects identified and their role, if any, in disease production studied.

(c) *Virus Pathology.*

The possibility of the disease being of virus origin may also be kept in view and transmission studies attempted according to the well known virological methods.

9. *Pot culture studies.*

Controlled pot culture studies with arecanuts using macro and micro nutrients may be conducted in the field laboratory at Alibag to study the relative role of



the different nutrients in disease causation. The seedlings used should, as far as possible, be uniform. Fairly large containers which would allow the palm to develop normally would have to be made.

10. *Field experiments.*

Well laid out field experiments with a sufficient number of replications and conforming to statistical requirements with NPK (revised dose) and the important micronutrients grouped in convenient groups may be conducted in representative areas of Colaba and Ratnagiri Districts both for arecanuts and coconuts. In these experiments both soil treatment and foliar spray application of micronutrients may be included. A proper analysis of the pre and post-treatment condition and the quality of water used for irrigation should be made. Scheduled observations on the experimental palms should be regularly recorded at quarterly intervals.

11. *Maintenance of demonstration fields.*

Model demonstration gardens to demonstrate scientific methods of cultivation like proper spacing, controlled irrigation, manuring, inter-cultivation, plant protection etc., should be laid out at about four representative centres of Colaba and Ratnagiri Districts. Since demonstrations will have very little appeal to farmers, unless the treatments carried out are profitable, it would be necessary to work out the economics by maintaining costing accounts of various items of work carried out. Observations on the incidence of disease, yield and quality of the produce obtained as determined by trade grades should be recorded.

## PART V

### Organisational set up

It may be seen from the foregoing account that the work envisaged is of a thorough and comprehensive nature covering almost all aspects of investigation. It is anticipated that if the various items of work are



carried out it should be possible to find out the actual cause of the disease and suggest appropriate remedial measures. Taking all aspects into consideration and after a thorough discussion with the representatives of the organisations which have to carry out the work, the staff that would be required during the period of the scheme has been arrived at and is detailed in Part VI of this report.

Taking into account the background of the investigation of the *Band* disease of arecanut and coconut in Bombay State and the achievements so far obtained, the Sub-Committee strongly recommend that the organisations concerned with the earlier investigations may be allowed to continue the work and bring it to a successful conclusion. While the main responsibility for the investigation will rest with the Department of Agriculture, Bombay State, the M. A. C. S. is also very much in the picture. They wield a lot of local influence in the areca and coconut tract of Colaba and Ratnagiri Districts. Our visits to these places and Poona in particular have enabled us to appreciate fully the potentiality of a private organisation in carrying out investigations which normally are considered to fall within the scope of Government Departments. It is, therefore, very desirable that the Government and the Commodity Committees like the Indian Central Arecanut Committee and the Indian Central Coconut Committee extend financial help to such an organisation to enable it to continue its useful work. Associating two organisations—Governmental and private—for the purposes of a common investigation is generally understood to be beset with practical difficulties in working, but in this particular case we are happy to record that evidence of complete co-operation and goodwill exists between the officers of the Department of Agriculture and the M. A. C. S. This attitude of the two organisations should be capitalised to the fullest possible extent by yoking together the experienced hands available with them to achieve the common objects. The Sub-Committee, therefore, strongly recommend that the Department of Agriculture, Bombay State and the M. A. C. S., Poona should be allowed to

join hands in the *Band* diseases investigation of arecanut and coconut. For convenience in execution the following allotment of work between the two organisations is suggested.

(a) *Department of Agriculture.*

*Items.*

- (1) Disease survey.
- (2) Soil survey.
- (3) Soil analysis.
- (5) Study of the quality of irrigation water.
- (6) Plant analysis (a) Sampling technique.
- (8) Plant protection.
- (9) Pot culture studies.
- (10) Field experiments.
- (11) Maintenance of demonstration fields.

(b) *M. A. C. S.*

*Items.*

- (4) Microbiological assay.
- (6) Plant analysis—(a) Sampling technique.
- (6) Plant analysis—(b) Chromatographic analysis.
- (6) (c) Chlorophyll.
- (6) (d) Enzymes.
- (7) (a) Botanical study—Anatomical study.
- (7) (b) Root study.

The M. A. C. S. will also associate and collaborate with the Department in taking observations in manurial trials.

### Technical Committee

For the efficient planning and execution of the work which covers various aspects of investigation the Sub-Committee feel that an expert Technical Committee be constituted to work out details of the technical programme and watch the progress of work from time to time. The constitution of such a Committee in this case is considered very desirable since two separate agencies are to execute the work and the scheme is to be financed by the Government of Bombay State and the Indian Central Arecanut Committee and the Indian



Central Coconut Committee. The following Technical Committee is suggested.

1. Government Agricultural Chemist—Bombay State.
2. Director of Research, Indian Central Coconut Committee.
3. Arecanut Specialist, Indian Central Arecanut Committee.
4. Horticulturist, Bombay State.
5. Soil Specialist, Bombay State.
6. Prof. S. P. Agharkar, Director, M. A. C. S.

The Entomologist and Plant Pathologist, Bombay State may be co-opted whenever necessary.

## PART VI

### Staff structure

#### (a) *Department of Agriculture*

1. Research Officer 1) on Rs. 220-15-400-20-500-25-650
2. Research Assistants,  
Grade I, (Plant Protection & Agronomy) 2) on Rs. 210-10-300
3. Research Assistants  
Grade II (Chemistry) 2) on Rs. 100-8-140-10-200
4. Agricultural Assts. 4) on Rs. 55-3-85-4-124-5-140
5. Laboratory Assts. 2)
6. Class IV Officers 3) on Rs. 30- $\frac{1}{2}$ -35

#### (b) *M. A. C. S.*

1. Research Officer 1) on Rs. 250-15-400-20-500
2. Biochemist 1) on Rs. 210-10-300
3. Botanist (Anatomy) 1) on Rs. 210-10-300
4. Laboratory Assts. 3) on Rs. 85-4-125-5-140
5. Class IV Officers. 3) on Rs. 30- $\frac{1}{2}$ -35

The above-mentioned staff is considered to be very necessary for the efficient execution of the different items of work suggested in the report.



## Part VII

### Financial Implications

The investigations on the *Band* disease of arecanuts and coconuts which is to be run for a period of five years is estimated to cost a sum of Rs. 2,82,848/- as summarised below:—

|                                                | Dept. of<br>Agriculture<br>Rs. | M. A. C. S.<br>Rs. | Total<br>Rs. |
|------------------------------------------------|--------------------------------|--------------------|--------------|
| <i>Non-recurring</i>                           |                                |                    |              |
| 1. Laboratory<br>Equipment<br>(microtome etc.) |                                | 5,000              | 5,000        |
| <i>Recurring</i>                               |                                |                    |              |
| 1. Pay of staff                                | 82,200                         | 66,720             | 1,48,920     |
| 2. Allowances etc.                             | 48,384                         | 34,044             | 82,428       |
| 3. T. A.                                       | 8,500                          | 6,000              | 14,500       |
| 4. Contingencies                               | 22,000                         | 10,000             | 32,000       |
| Grand Total                                    | 1,61,084                       | 1,21,764           | 2,82,848     |

Details of expenditure, year-war, are furnished in Tables I and II.

The Sub-Committee suggests that the expenditure as detailed above may be shared equally by the Indian Central Arecanut Committee, the Indian Central Coconut Committee and the Department of Agriculture, Bombay State.

### Summary and Recommendations

About 5,790 acres of arecanut and 15,152 acres of coconut gardens lie concentrated in the coastal tracts of Colaba and Ratnagiri in Bombay State.

The *Band* disease on arecanut has been in existence for over 80 years. The disease occurs on young, adult and aged palms with characteristic symptoms of shortened leaves with intense dark green colour, arresting growth and production ultimately resulting in their death. Coconut palms grown closely associated with arecanut palms also get infected and the incidence

extending to 20% in certain cases. The symptoms of disease on coconut consist in the leaves becoming smaller in size, leaflets presenting a jointed and fasciated appearance developing a glabrous texture. The size of the stem at the crown gets appreciably reduced and within the course of two or three years tapers like a pencil point, the crown toppling over leaving the headless stem. The disease occurs on coconut palms from sixth year onwards. Affected palms die within three or four years. The *Band* diseases of arecanut and coconut are rather serious, in that they reduce the yields and finally cause destruction of the palms uprooting the economy of the farmers of Colaba and Ratnagiri who depend entirely on these crops for their sustenance.

The Scheme on *Band* disease investigation of arecanut was sponsored by both State Department of Agriculture, Bombay, and Maharashtra Association for the Cultivation of Science, Poona, and disease investigations on coconut palm being investigated by the Maharashtra Association for the Cultivation of Science, Poona. Under the scheme sponsored by the State Department of Agriculture, a reconnaissance survey was undertaken; analysis of soil samples of healthy and diseased gardens were done; feeler trials were laid out in private gardens to see the effect of general manuring with N, P, K, lime, copper and zinc, and certain other micronutrients revising the treatments. Observations indicated that manganese and copper sprays brought about some improvements in well managed gardens. Regular experiments with macro and micro nutrients have been laid out with 14 selected treatments. Observations are in progress.

A demonstration garden, one acre in extent, has been maintained at Shrivardhan.

The investigations under the Maharashtra Association for the Cultivation of Science consist of field experiments with copper sulphate, boric acid, zinc sulphate, ferrous sulphate and lime applied to soil around roots every six months at the rate of one ounce per palm and continued for three years. Observations so far



taken indicate that copper sulphate gave the best response in improving condition of the palm and inducing flowering. About 50% of the palms receiving zinc sulphate and boric acid showed signs of recovery. Addition of ferrous sulphate and lime did not have any appreciable effect.

A new field experiment was laid at Murudi consisting of copper sulphate, zinc sulphate, boric acid, alum, manganese sulphate, N, P, K, and sodium sulphate. No appreciable change has so far been noticed in the palms. Chemical analysis of soils among the roots of the diseased and healthy palms did not reveal any significant deficiency of macro or micro nutrients in the diseased and healthy soils. Slight variation in nitrification, production of carbon dioxide and bacterial difference were noted between diseased and healthy soils.

The investigations on *Band* disease of coconut by the Maharashtra Association for the Cultivation of Science gave similar results. The leaf analysis on diseased and healthy coconut palms showed that copper and manganese contents of the leaves of healthy palms were higher than those of the diseased palms. The field experiments consisting of soil application of boric acid, manganese sulphate, copper sulphate, zinc sulphate and a mixture of the above micronutrients showed some favourable response in diseased palms particularly in treatments having the N, P, K, and the mixture of micronutrients. Copper sulphate, boric acid and zinc sulphate singly applied appear to be beneficial to some extent.

In pot culture experiments best growth was obtained in seedlings which received double dose of copper, zinc and boron while the plants receiving single dose of copper, zinc, and boron showed poor growth.

On the spot inspection of experimental works in the field and in the laboratory and a critical examination of the data already gathered showed that the work has to be carried out more systematically and thoroughly and that by combining the *Band* disease investigation schemes on arecanut and coconut into a co-ordinated



scheme and harnessing the trained technical personnel of the Department of Agriculture and Maharashtra Association for the Cultivation of Science. The work could be carried out more efficiently and economically. The Sub-Committee has, therefore, made the following recommendations:—

### Recommendations

1. Larger number of the soil samples representing the entire tract and profiles of soils in relation to the health of the palms and root penetration are indicated and for examination while conducting micro-biological assay, chromatographic analysis and other soil studies.

2. The basis of the present doses of fertilizers has to be worked out with reference to the actual levels of the fertility of the soils. Similarly, the method of their application, viz., broadcast *versus* trench or basin, depth of application and time of application etc. have to be determined for the tract.

3. A more efficient method of application of micronutrient appears to be necessary in view of the smallness of doses used. The micronutrients may be grouped into convenient and compatible lots and applied with N. P. K. as basal dressing. The evaluation of the effect of the individual nutrients, macro and micro may be studied under controlled conditions in pot culture, the pot culture studies being restricted to arecanuts only.

4. Analysis of irrigation water is considered necessary particularly for its salt content, conductivity, etc.

5. Standardisation of sampling techniques for different parts of arecanut palm, for chemical analysis have to be worked out at the first instance on lines of techniques evolved for coconuts.

6. The anatomical studies of different parts of the palms are very important.

7. A field laboratory to carry out field investigations and pot culture shade is recommended to be established at a convenient site by the State Department of Agriculture.

8. The continuation of the investigation on a more thorough basis for a period of five years so as to obtain reliable data on the various aspects of the *Band* disease of coconut and arecanut palms was recommended.

9. The etiology of the disease from different aspects has not been taken into account and it is recommended that a re-orientation in outlook and amplification of the investigations on the *Band* on arecanut and coconut appear fully warranted. Combined technical programme of the following nature for further period of five years has been recommended:-

1. Disease survey
2. Soil survey
3. Soil analysis
4. Microbiological assay
5. Study of the quality of irrigation water
6. Plant analysis consisting of sampling, technique, etc.
7. Botanical studies consisting of anatomical studies, root studies etc.
8. Plant protection
9. Pot culture studies
10. Field experiments
11. Maintenance of demonstration fields.

10. The Department of Agriculture, Bombay State, and the Maharashtra Association for the Cultivation of Science, Poona, with their joint efforts have to continue to carry on investigation on arecanut and coconut and for the convenience of execution, the following allotment of work between the two organisations is suggested:-

(a) *Department of Agriculture*

*Items*

- 1) Disease survey
- 2) Soil survey
- 3) Soil analysis
- 5) Study of the quality of irrigation water
- 6) Plant analysis (a) sampling technique
- 8) Plant protection
- 9) Pot culture studies

- 10) Field experiments
- 11) Maintenance of demonstration fields.

(b) *Maharashtra Association for the Cultivation of Science.*  
*Items*

- 4) Microbiological assay
- 6) Plant analysis (a) Sampling technique
- 6) Plant analysis (b) Chromatographic analysis
- 6) (c) Chlorophyll
- 6) (d) Enzymes
- 7) (a) Botanical study – Anatomical study
- 7) (b) Root study

11. The State Government and the two Commodity Committees viz., the Indian Central Arecanut Committee and the Indian Central Coconut Committee should extend financial help to meet the field requirements of the finances for undertaking these investigations.

12. A Technical Sub-Committee to draw up detailed technical programme and to review the progress of the work periodically preferably every half year has been proposed.

13. The staff pattern for conducting the scheme for a period of five years taking into consideration the utmost necessity for effecting economy and the financial implications have been indicated.

14. It has been suggested that the total expenditure of Rs. 2,82,848 be shared equally by the Indian Central Arecanut Committee, Indian Central Coconut Committee and the State Department of Agriculture, Bombay, spread over a period of five years.

- |                           |      |
|---------------------------|------|
| 1. Sri. C. M. John        | (Sd) |
| 2. Dr. K. P. V. Menon     | (Sd) |
| 3. Sri. B. S. Varadarajan | (Sd) |



**TABLE I**  
**Department of Agriculture**

| Sl. No.                              | Designation and Grade                                        | Pay                             | First year | Second year | Third year | Fourth year | Fifth year | Total for 5 years |
|--------------------------------------|--------------------------------------------------------------|---------------------------------|------------|-------------|------------|-------------|------------|-------------------|
| (1)                                  | (2)                                                          | (3)                             | (4)        | (5)         | (6)        | (7)         | (8)        | (9)               |
| 1                                    | Research Officer                                             | 1) Rs. 220-15-400-20-500-25-650 | Rs. 2,640  | Rs. 2,820   | Rs. 3,000  | Rs. 3,180   | Rs. 3,360  | Rs. 15,000        |
| 2                                    | Research Assistants, Grade I (Plant Protection and Agronomy) | 2) Rs. 210-10-300               | 5,040      | 5,280       | 5,520      | 5,760       | 6,000      | 27,600            |
| 3                                    | Research Assistants, Grade II (Chemistry)                    | 2) Rs. 100-8-140-10-200         | 2,400      | 2,592       | 2,784      | 2,976       | 3,168      | 13,920            |
| 4                                    | Agricultural Assistants                                      | 4) Rs. 55-3-85-4-125-5-140      | 2,640      | 2,784       | 2,928      | 3,072       | 3,216      | 14,640            |
| 5                                    | Laboratory Assistants                                        | 2) do.                          | 1,320      | 1,392       | 1,464      | 1,536       | 1,608      | 7,320             |
| 6                                    | Class IV Officers                                            | 2) Rs. 30-1-35                  | 720        | 732         | 744        | 756         | 768        | 3,720             |
|                                      |                                                              |                                 | 14,760     | 15,600      | 16,440     | 17,280      | 18,120     | 82,200            |
| <i>Dearness and other allowances</i> |                                                              |                                 |            |             |            |             |            |                   |
| 1                                    | Research Officer                                             | 1) Rs. 85                       | 1,020      | 1,020       | 1,020      | 1,080       | 1,092      | 5,232             |
| 2                                    | Research Assistants Grade I                                  | 2) Rs. 85                       | 2,040      | 2,040       | 2,040      | 2,040       | 2,040      | 10,200            |
| 3                                    | Research Assistants Grade II                                 | 2) Rs. 55                       | 1,320      | 1,608       | 1,608      | 1,608       | 1,608      | 7,752             |

| (1) | (2)                               | (3) | (4)    | (5)    | (6)    | (7)    | (8)    | (9)      |
|-----|-----------------------------------|-----|--------|--------|--------|--------|--------|----------|
| 4   | Agricultural Assistants 4) Rs. 55 |     | 2,640  | 2,640  | 2,640  | 2,640  | 2,640  | 13,200   |
| 5   | Laboratory Assistants 2) Rs. 55   |     | 1,320  | 1,320  | 1,320  | 1,320  | 1,320  | 6,600    |
| 6   | Class IV Officers 2) Rs. 45       |     | 1,080  | 1,080  | 1,080  | 1,080  | 1,080  | 5,400    |
|     | T. A.                             |     | 2,000  | 2,000  | 1,500  | 1,500  | 1,500  | 8,500    |
|     | Contingent expenditure            |     | 5,000  | 5,000  | 4,000  | 4,000  | 4,000  | 22,000   |
|     |                                   |     | 31,180 | 32,308 | 31,648 | 32,548 | 33,400 | 1,61,084 |

*Note:—* Non-recurring expenditure towards equipments, laboratory facilities, providing Jeep with trailer etc., have to be met by the State Department of Agriculture as per the rules governing the General Conditions Applicable to the Grants made by the Committee.

TABLE II

M. A. C. S.

| Sl. No.                                    | Designation and Grade | Pay                          | First year | Second year | Third year | Fourth year | Fifth year | Total for 5 years |
|--------------------------------------------|-----------------------|------------------------------|------------|-------------|------------|-------------|------------|-------------------|
| 1                                          | Research Officer      | 1) Rs. 250-15-400-20-500     | Rs. 3,000  | Rs. 3,180   | Rs. 3,360  | Rs. 3,540   | Rs. 3,720  | Rs. 16,800        |
| 2                                          | Biochemist            | 1) Rs. 210-10-300            | 2,520      | 2,640       | 2,760      | 2,880       | 3,000      | 13,800            |
| 3                                          | Botanist (Anatomy)    | 1) Rs. 210-10-300            | 2,520      | 2,640       | 2,760      | 2,880       | 3,000      | 13,800            |
| 4                                          | Laboratory Assistants | 3) Rs. 85-4-125-5-140        | 3,060      | 3,204       | 3,348      | 3,492       | 3,636      | 16,740            |
| 5                                          | Class IV Officers     | 3) Rs. 30- $\frac{1}{2}$ -35 | 1,080      | 1,098       | 1,116      | 1,134       | 1,152      | 5,580             |
|                                            |                       |                              | 12,180     | 12,762      | 13,344     | 13,926      | 14,508     | 66,720            |
| <i>Dearness and other allowances.</i>      |                       |                              |            |             |            |             |            |                   |
| 1                                          | Research Officer      | 1) Rs. 85                    | 1,020      | 1,080       | 1,092      | 1,104       | 1,116      | 5,412             |
| 2                                          | Biochemist            | 1) Rs. 85                    | 1,020      | 1,020       | 1,020      | 1,020       | 1,020      | 5,100             |
| 3                                          | Botanist (Anatomy)    | 1) Rs. 85                    | 1,020      | 1,020       | 1,020      | 1,020       | 1,020      | 5,100             |
| 4                                          | Laboratory Assistant  | 3) Rs. 55                    | 1,980      | 1,980       | 1,980      | 1,980       | 2,412      | 10,332            |
| 5                                          | Class IV Officers     | 3) Rs. 45                    | 1,620      | 1,620       | 1,620      | 1,620       | 1,620      | 8,100             |
|                                            |                       |                              | 6,660      | 6,720       | 6,732      | 6,744       | 7,188      | 34,044            |
| T. A.                                      |                       |                              |            |             |            |             |            |                   |
| <i>Contingent expenditure</i>              |                       |                              |            |             |            |             |            |                   |
| Capital expenditure (Laboratory Equipment) |                       |                              |            |             |            |             |            |                   |
|                                            |                       |                              | 5,000      | —           | —          | —           | —          | 5,000             |
|                                            | Grand Total           |                              | 27,340     | 22,982      | 23,076     | 23,670      | 24,696     | 1,21,764          |



Extract from the Proceedings of the Tenth Annual General Meeting of the Indian Central Arecanut Committee held at Trivandrum on 12th January, 1959.

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*Subject No. 54.* Scheme for the investigation of 'Band' disease of areca palm in Bombay State conducted by the Maharashtra Association for the Cultivation of Science—Review of the work done from 9-12-1954 to 31-5-1958.

The Sub-Committee re-commended that a Special Sub-Committee consisting of the following, should review the progress of the scheme:—

1. Shri. C. M. John.
2. Dr. K. P. V. Menon.
3. Shri. S. Sirur, Agricultural Chemist to Government of Mysore.
4. Secretary, Indian Central Arecanut Committee (Convener)

The above Sub-Committee would also review the progress of the scheme conducted by the State Department of Agriculture.

The Committee accepted the above recommendation.

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Extract from the Proceedings of the 26th meeting of the Indian Central Coconut Committee held at Trivandrum on 17th January, 1959.

*Subject No. 23.* Scheme for the investigation of the 'Band' disease of the coconut palm in Bombay State — Report of the Plant Physiologist, Central Coconut Research Station, Kayangulam on.

The Sub-Committee had noted the recommendations of the Plant Physiologist, Central Coconut Research Station, Kayangulam, on the working of the scheme and recommended that as the Indian Central Arecanut

Committee had appointed a small Expert Committee to report on what should be the future work on 'Band' disease on arecanuts at the Poona centre and since there was a suggestion that the disease on the two palms may be the same, the same team (on which the Indian Central Coconut Committee was already represented) might be asked to make recommendations in respect of the disease of coconuts also. Since the present scheme was due to terminate on 14-1-1960 it was recommended by the Sub-Committee that the report of the Expert Committee might be obtained early and placed before a joint meeting of the Agricultural Research Sub-Committees of the Indian Central Coconut Committee and the Indian Central Arecanut Committee and that a special early meeting of these two Sub-Committees might be arranged for the purpose.

The Committee accepted the recommendation.

## APPENDIX XIII

### Secretary's Note

*Subject No. 30.* Scheme for laying out simple manurial trials in coconut cultivators' gardens.

The Indian Central Coconut Committee at its last meeting (January 1959) while considering the Working Paper on Coconut Research under the III, IV and V Five-Year Plans, had decided as follows:-

"Although evidence has been gathered to show that the coconut responds to a balanced application of N,P,K, fertilisers over a basal dressing of organic matter, further detailed investigations appear to be necessary under cultivator's conditions. Model agronomic experiments on the cultural and manurial aspects may be laid out in selected centres in the typical regions to gather additional and more precise data. The role of micronutrients in the physiology of coconut deserves more elaborate investigation".



On the suggestion of Dr. B. P. Pal, Director, Indian Agricultural Research Institute and Chairman of the Agricultural Research and Development Sub-Committee (Research Wing), Dr. G. R. Seth, Deputy Statistical Adviser, Indian Council of Agricultural Research has now forwarded a scheme (copy attached) prepared by him for laying out simple manurial trials in coconut cultivators' gardens.

The salient features of the scheme are the following:-

1) The trials will be carried out in 13 centres distributed in the main coconut growing States. Of these 7 centres will be established in Kerala, 2 in Mysore and one each in Madras, Andhra Pradesh, Bombay and Orissa. Each centre will consist of an area of 8 miles radius round about the Coconut Research Stations. The experiments will be confined to pure coconut plantations, if available. If not, gardens where coconut palms predominate will be selected for the experiments. There will be 18 experiments for each centre.

2) Each centre will be in charge of a Field Assistant in the scale of Rs. 60-130 and his work will be supervised by the Officer-in-charge of the Regional Coconut Research Station to which it is attached. In Kerala State where a larger number of centres are proposed to be established, a separate Supervisor in the scale of Rs. 160-10-330 has been proposed to be appointed.

3) The entire staff will work under the control of the Director of Agriculture of the concerned State. Where the centres are located near the Central Coconut Research Stations of the Committee, the control will be exercised by the Directors of the Stations.

4) The records and other data will be compiled and kept up-to-date in the office of the Committee. For this work one Statistical Assistant on Rs. 160-10-330 and one Senior Computer in the scale of Rs. 120-220 are proposed to be appointed.

The total cost of the scheme has been estimated at Rs. 2.5 lakhs for a period of 5 years. It is suggested that the expenditure on field staff and the working expenses may be shared by the Committee and the concerned State



Governments in equal proportion. The expenditure on the staff at the headquarters of the Committee may be met entirely by the Committee. If this suggestion is approved the shares of the State Governments and the Committee for a period of 5 years will be as follows:-

|                                        |                     |
|----------------------------------------|---------------------|
| 1. Kerala                              | Rs. 63,865          |
| 2. Mysore                              | Rs. 15,290          |
| 3. Madras                              | Rs. 7,645           |
| 4. Andhra Pradesh                      | Rs. 7,645           |
| 5. Bombay                              | Rs. 7,645           |
| 6. Orissa                              | Rs. 7,645           |
| 7. Indian Central Coconut<br>Committee | Rs. 1,40,255        |
|                                        | <u>Rs. 2,49,990</u> |

The Committee may now decide whether they would approve of the scheme and if so, whether the expenditure on it may be shared as indicated above.

The subject may first be considered by the Agricultural Research and Development Sub-Committee (Research Wing).

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### **Scheme for laying out Simple Manurial Trials on Coconuts in Cultivators' Gardens.**

The importance of carrying out fertilizer trials in cultivators' fields under the normal farming conditions of the cultivators has been clearly recognised. A large number of such fertilizer trials on annual crops are being carried out under various schemes of the Government of India. The results obtained in these trials have proved very valuable in making recommendations to the cultivators on the proper manurial schedule. There have not been similar trials on perennial crops except for the fertilizer demonstrations on coconut carried out by the Potascheme. Fertiliser experiments in cultivators' fields on arecanut crop have been recently initiated by the Central Arecanut Committee. The Indian Central Coconut Committee also appointed a Special Sub-Committee for drawing up a scheme for carrying out simple

manurial trials in cultivators' gardens. This Committee, after a meeting held in Hyderabad on 11th October, 1957, submitted a scheme for carrying out two hundred trials. However, the Central Coconut Committee in its meeting held at Kozhikode on 31st January, 1958 felt that it will not be feasible to take up the trials at present. The Committee recommended that the results obtained in the demonstrations carried out by the Potascheme may be utilised in making fertilizer recommendations. The main object of the trials carried out by the Potascheme was to demonstrate the effectiveness of a selected NPK combination against the local manurial practice. Accordingly these trials generally consisted of only two treatments (cultivators normal practices) and NPK and in a few cases a third treatment with an increased level of Potash was also tried. It is clear from the nature of the treatments that these trials cannot provide any information on the requirements of the coconut palm for individual plant nutrients, N, P and K and their combinations. This information is essential in making recommendations on optimum fertilizer use to the cultivators since both responses to combinations of nutrients and also their cost has to be taken into account in making these recommendations. It is, therefore, necessary that more comprehensive trials are carried out in the important coconut growing regions. Apparently the complex nature of the crop and consequent practical difficulties in executing satisfactorily any large programme of experiments in scattered gardens of cultivators might have influenced the decision of the Committee to postpone taking up such a scheme. That it is possible to surmount these difficulties and carry out such experiments in cultivators' gardens has been amply demonstrated by the demonstrations carried out by the Potascheme and the new trials launched by Arecanut Committee on arecanut. It is also essential to take up the work immediately as it will take some years to obtain conclusive results from perennial crops like coconut. Experience with other crops has shown that such trials are a very effective medium of making cultivators fertilizer minded and simple fertilizer trials on coconuts therefore form



an important item in our campaign to increase the production of coconuts in this country. The cost involved would be quite small compared to the practical results that can be achieved. Based on the original scheme prepared by the Special Sub-Committee and the experience of the Potascheme, a revised scheme which is somewhat simpler operationally is proposed. The valuable experience gained in the Potascheme trials can be taken advantage of in the planning and organisation of the scheme.

### PROGRAMME

The following three types of 8-plot trials, to be carried out in equal number, shall be laid out:—

- (a)  $O_1 N_1, N_1 P_1, N_1 P_1 K_1, N_1 P_1 K_2, N_2 P_2, N_2 P_2 K_1, N_2 P_2 K_2$
- (b)  $O, P_1, P_1 K_1, N_1 P_1 K_1, N_2 P_1 K_1, P_2 K_2, N_1 P_2 K_2, N_2 P_2 K_2$
- (c)  $O, K_1, N_1 K_1, N_1 P_1 K_1, N_1 P_2 K_1, N_2 K_2, N_2 P_1 K_2, N_2 P_2 K_2$

Where,

|       |                   |                       |
|-------|-------------------|-----------------------|
| $N_1$ | 0.75 lb. or       | } per tree per annum. |
| $N_2$ | 1.60 „            |                       |
| $P_1$ | 0.50 lb. $P_2O_5$ |                       |
| $P_2$ | 1.00 „            |                       |
| $K_1$ | 1.00 lb. $K_2O$   |                       |
| $K_2$ | 2.00 „            |                       |

Nitrogen will be supplied in the form of Ammonium sulphate (20.6% N), Phosphoric acid in the form of super phosphate, simple N triple (16%  $P_2O$ ) and potash in the form of muriate of potash (60%  $K_2O$ ).

The fertilizer will be applied in a single dose in a basin round the tree except in sandy soils where the fertilisers are to be applied in two split doses – half pre-monsoon and half post-monsoon.

#### *Selection of sites and distributions of experiments.*

The experiments will be carried out in 13 centres distributed in the main coconut growing States as given below. Each centre will consist of an area of about 8 miles radius around each coconut research station.

\* In case the requisite number of research stations are not in existence, the centres may be selected near the proposed site of research stations.



| State  | Number of centres | Number of experiments |
|--------|-------------------|-----------------------|
| Kerala | 7                 | 126                   |
| Mysore | 2                 | 36                    |
| Orissa | 1                 | 18                    |
| Andhra | 1                 | 18                    |
| Madras | 1                 | 18                    |
| Bombay | 1                 | 18                    |
| Total  | 13                | 234                   |

In places like Kerala, where coconuts are mostly grown as a pure plantation, the experiments will be confined only to such gardens. In other States as well, care will be taken to select pure gardens but if such gardens are limited, experiments should be laid out in mixed plantations where the coconut palms predominate.

In each centre six villages will be selected at random and in each selected village, three experiments one of each type will be laid out. There will be thus 18 experiments in a centre, six of each type.

|                        |                                                                                                                |
|------------------------|----------------------------------------------------------------------------------------------------------------|
| Size per plot: 6 trees | } As fertilizers will be applied in basins round the tree, it will not be necessary to provide for guard rows. |
| Size per experiment:   |                                                                                                                |
| 48 trees.              |                                                                                                                |

#### *Demonstration of plots.*

Immediately after selection of fields, each tree will be serially numbered and the number painted on the tree. The positions of these trees along with trees other than coconuts (if any), or any hut or channel in or near the fields will be shown in a field sketch.

A survey of the general condition (healthy, diseased, bearing or non-bearing), age, number of leaves etc., of each individual tree will be carried out and notes recorded on a special proforma.

The following categories of trees will be excluded from the trials as it will be desirable in the first instance to obtain information for making recommendations to normal bearing trees:—

- (i) Severely diseased trees.

- (ii) Trees which are either not bearing or have started bearing only recently.
- (iii) Very old trees, say above 50 years of age.
- (iv) Trees near the huts or headlands of channels.

If the remaining trees are more than 48 in number, the experiment will be confined to the area having more uniform trees.

Eight clusters of six contiguous trees will be formed and the treatments will be randomly allocated, one to each cluster according to type of experiment.

For convenience, the treatments may be referred to as A,B,C,D,E,F etc. The serial number of each tree and the treatment given to it should be painted on every individual tree.

### *Observations*

i) The Field Assistant will attend to every harvest in all the fields under his charge.

ii) The Field Assistants will record the harvest of each individual tree, bunch by bunch, on forms to be specially prepared for the purpose. They will not only record the harvested nuts, but also the 'shed nuts', 'stolen nuts' and 'barren nuts' to make the data complete. In this connection, it is important to note that while 'stolen nuts' and matured shed nuts are good nuts and have got to be considered in the comparison of treatments, the immature shed nuts and 'barren nuts' are bad nuts which ought to be excluded from the comparison. However, 'shed' and 'barren' nuts give another important information regarding their control by the fertilizer treatment.

iii) While 'barren nuts' can be noticed at the time of harvest, information on the number of 'shed nuts' and 'stolen nuts' cannot be accurately obtained unless prior estimate on the production of each bunch is made. For this purpose, an estimate on the number of nuts on the next four bunches will be made at every harvest.



Provision for these estimates will be made in the proforma referred to in item ii) above. Besides giving a count of the number of 'shed' and 'stolen' nuts, these estimates will serve:

- a) to build up the records if by chance any harvest record is missed
- and b) to provide a means for the Head Office and supervisory staff to check on the accuracy of the records sent by the demonstrators.
- iv) The records and other data will be sent to the central office of the Indian Central Coconut Committee, where they will be compiled and kept up-to-date.

#### *Organisation*

i) One Field Assistant will be appointed for each centre consisting of eighteen experiments.

ii) The work of each Field Assistant will be supervised by the Officer-in-charge of the Regional Coconut Research Stations. In Kerala, where there will be 7 centres, a separate Supervisor may be appointed in addition for the effective control over the work of all the Field Assistants.

iii) Where Regional Coconut Research Stations have not yet been established in addition to the Field Assistant a Maistry may be provided.

iv) The entire staff in a State under the scheme will work under the control of the Director of Agriculture or any other officer nominated by him. For those centres located at the Research Stations of the Committee, the control will be exercised by the Director, Central Coconut Research Station.

v) It will be necessary to provide a cycle allowance to the Field Assistant to enable him to lay out the trials and exercise effective supervision over the experiments.

vi) The success of any scheme like the one under consideration depends on the efficiency of the field staff in carrying out the various operations. Therefore, it is necessary to select properly qualified staff and provide for them intensive training at the Central Coconut Research Station, Kasaragod before entrusting them with the work of the scheme.



### Budget Estimates of the scheme for five years

|                                                                                              |                 |                 |
|----------------------------------------------------------------------------------------------|-----------------|-----------------|
| 1. Salaries and other allowances to be paid to field staff.                                  | Rs.             | Rs.             |
|                                                                                              | (at one centre) | (at 13 centres) |
| Pay of one Field Assistant (on Rs. 60-3-81-EB-4-125-5-130) for every unit of 18 experiments. | 3,960           | 51,480          |
| D.A. etc., of one Field Assistant                                                            | 3,000           | 39,000          |
| T. A. of one Field Assistant                                                                 | 1,500           | 19,500          |
|                                                                                              | <u>8,460</u>    | <u>1,09,980</u> |
| Pay of one Supervisor (on Rs. 160-10-330) to be provided for Kerala                          | 10,800          | 10,800          |
| D. A. etc.                                                                                   | 3,900           | 3,900           |
| T. A.                                                                                        | 6,000           | 6,000           |
|                                                                                              | <u>20,700</u>   | <u>20,700</u>   |
| Total (1)                                                                                    | <u>29,160</u>   | <u>1,30,680</u> |
| 2. Working expenses                                                                          |                 |                 |
| Cost of fertilizers to be given free                                                         | 4,000           | 52,000          |
| Printing of proforma etc.                                                                    | 1,000           | 13,000          |
| Postage and Stationery                                                                       | 1,000           | 13,000          |
| Miscellaneous                                                                                | 830             | 10,790          |
| Total (2)                                                                                    | <u>6,830</u>    | <u>88,790</u>   |
| 3. Statistical staff at the headquarters of the Committee                                    |                 |                 |
| Pay of one Statistical Assistant (on Rs. 160-10-330)                                         | 10,800          | 10,800          |
| Pay of one Senior Computer (on Rs. 120-8-200-10,2-220)                                       | 8,160           | 8,160           |
| D. A. etc., of Statistical Assistant                                                         | 3,900           | 3,900           |
| D.A. etc., of Senior Computer                                                                | 3,660           | 3,660           |
| T. A.                                                                                        | 4,000           | 4,000           |
| Total (3)                                                                                    | <u>30,520</u>   | <u>30,520</u>   |
| Grand Total                                                                                  | <u>66,510</u>   | <u>2,49,990</u> |
|                                                                                              | Say 2.5 lakhs.  |                 |

## APPENDIX XIV

### Secretary's Note

*Subject No. 32.* Proceedings of the meeting of the Special Sub-Committee for drawing up the programme of genetical and breeding work at the Central Coconut Research Station, Kasaragod.

The Indian Central Coconut Committee at its last meeting (January 1959) had considered the observations of Professor J. B. S. Haldane on the breeding work in progress at the Central Coconut Research Station, Kasaragod and his article entitled "Suggestions for research on coconut" (Vide Annexure I) and decided that since coconut breeding was of a long-range character it was very necessary to plan it in accordance with genetical principles as thoroughly as possible and that a special Sub-Committee consisting of the following members be set up to go into the subject very thoroughly and to draw up a detailed long-range programme for the genetical and breeding work to be carried out at the Station.

1. Dr. S. M. Sikka - (Chairman)
2. Sri. C. M. John.
3. Dr. M. S. Swaminathan.
4. Dr. V. G. Panse and
5. Dr. K. C. Naik.

The Sub-Committee accordingly met at the Central Coconut Research Station, Kasaragod on the 18th April 1959 under the Chairmanship of Dr. S. M. Sikka. A copy of the proceedings of the meeting forwarded by Dr. Sikka is attached (Vide Annexure II). He has stated that the proceedings have been sent to the other members of the Sub-Committee also.

The proceedings may be considered first by the Agricultural Research and Development Sub-Committee (Research Wing).

## ANNEXURE I

### Suggestions for Research on Coconuts

By

J. B. S. HALDANE

*Indian Statistical Institute, Calcutta-35*

This article demands an apology. I am ignorant of the details of coconut culture, and have only spent a few hours at the Research Stations at Kayangulam and Kasaragod. I have, therefore, no doubt that many of my suggestions will be impracticable for different reasons. However, they may stimulate others to work along lines similar to those which I have suggested, but more likely to be successful.

#### *Mixed Cropping*

The soil beneath a coconut grove is capable of bearing another crop. This may be a "green manure" plant such as *Gliricidia* whose sole function is to aid the palm trees. If, however, the plants grown under the trees are to be harvested, I think one should consider three quite distinct questions.

1. Is it economically advantageous to grow  $x$  under coconut palms, not necessarily in every year, under existing conditions of manuring? In Kerala  $x$  might be a nutritious crop such as tapioca or, one such as cloves, black pepper or pan, the last of which demands shade in any case. In West Bengal pineapples and arrow root are often grown.

2. If it is found that such double cropping exhausts the soil and reduces the yield of coconuts under existing conditions, does it do so if chemical fertilisers are applied intensively? If so, it may be an economic proposition ten years hence, when India's output of fertilisers has been greatly increased. A knowledge of such possibilities will greatly help economic planning.

3. Is it practicable, if there is a threat of famine, to plant an important and quickly growing food source



which in Kerala would probably be tapioca, under coconut palms, without immediately reducing their yield? Such planting could be justified as an emergency measure, even if it would exhaust the soil and lower yields grossly if continued for a number of years.

These questions would of course have to be answered for several different types of soil in Kerala and later, no doubt, in other States. It is natural enough that stations charged with research on coconuts should concentrate on the question of how to get the highest yield of nuts, or of oil per acre per year. But the questions asked above are also important, both in the public interest and in that of the cultivators.

### *Bees*

I understand that the relative importance of wind and insect pollination of coconut palms is a matter of controversy. This suggests that in some circumstances insects may be important. It is very easy to decide this matter experimentally. They are extremely important for English fruit crops. Indeed, it has been stated that in England the value of bees in enhancing the yield of fruit trees is about three times that of the honey which they produce.

Their value, if any, in Kerala, could readily be discovered. I understand that bee-keeping is quite an important occupation in Coorg, but that bees often die in the hot whether in the plains, and may migrate uphill. It might, therefore, be necessary to take the bees into the hills during a part of the year. Fortunately in Kerala this would not be a long journey. The honey produced from the palm trees would be a clear addition to our food supply, but unless there was also a gain in coconut yield it might not pay for the labour and materials needed.

Linked up with this are two other questions. Would the insecticides used on coconut palm trees and other crops in the neighbourhood kill hive bees? And do they now kill wild bees and other insects to such an

extent as to lower the frequency of successful pollination, and thus the yield of coconuts? It is likely that the answer to these questions may be very different in different areas. For example sea spray, which certainly does not harm coconut trees, may have a considerable effect on insects.

### *Paternal influences on nuts*

Before I consider the possibilities of breeding, I should like to raise the question of the influence of the pollen parent on the coconut. The cultivated plant which from this point of view, resembles the coconut palm most closely, and which has been well studied is maize. Here, as in coconuts, the endosperm is the most important tissue from the human point of view. Although its nuclei contain two maternal sets of chromosomes and only one set of paternal chromosomes the latter can have an important influence on the carotene content, the type of carbohydrate, the content of several vitamins, and the anthocyanin coloration.

It should be possible to compare the size, oil content, and perhaps other characters of the nuts borne on the same tree after using pollen from two different "male" parents. It would be worth using as one pollen parent a tree with poor oil yield to give as high a contrast as possible with one of the desired type.

The result of such experiments might have no immediate bearing on breeding. However, it would at least tell us something about the genetical determination of the characters of the actual nut. There is another reason for making such experiments. Work on the genetics of the coconut must be very tedious. One may expect, in a life-time, to get information of the type which one obtains in a month with *Drosophila melanogaster*, for example evidence that an abnormality is recessive or that two genes are or are not linked. Unless the workers concerned are allowed to work on other genetical problems they will have to concentrate on other sides of coconut biology, and will get no experience of genetics. Ideally, I believe they should be



encouraged to breed annual plants. If not they could at least attack the question of the effect of pollen on the nuts.

There is, however, a possibility that hybrid vigour may show in the nuts derived by cross-pollination, since hybrid vigour in some species is largely due to increased seed weight. If so, it is possible that a mixed plantation may produce a better crop than either of two breeds when grown alone.

### *Vegetative propagation*

If it is possible to propagate a plant vegetatively, the plants derived from a single seedling by vegetative propagation form a clone whose members, in a constant environment, resemble one another very closely. Examples are named varieties of potatoes, roses, mangoes, and seedless bananas. Many new clones of tapioca have recently been produced in Kerala. Holttum (1955), Harland (1957) and perhaps others, have pointed out that if coconut palms could be propagated vegetatively, by planting cuttings, or by grafting on to seedlings, trees of high yield could be multiplied indefinitely. There are considerable differences in the yield of trees growing under very similar conditions. If one could propagate the best 1 per cent of trees in Kerala vegetatively there would be a very considerable increase in yield, though I have failed to discover data which would permit its estimation.

No method has yet been invented to permit the vegetative propagation of a given tree, though it could be rejuvenated and, perhaps, grown for another century or longer, by inducing aerial roots, sawing through the trunk below them and replanting (Menon, Davis Anandan and Pillai, 1955). It would surely be worth doing this systematically to trees of exceptionally high yield, if only to preserve them for future breeding. However, Davis (1950, 1956) reports branching in exceptional trees. If a tree can be propagated vegetatively, for whatever reason, it is of value in manurial trials even if its yield is low.



For the yields of two or more members of a clone in the same environment are probably very close. If so the differences between their yields in different environments are mainly due to the environmental differences. Bonnier (1948) and his colleagues found that by using pairs of monozygotic twins, he could reduce the number of calves needed in an experiment on the effect of diet on milk yield to about one twentieth of that required when comparisons were made between calves from the same herd. The use of vegetatively propagated trees may, therefore, allow far more trials to be made than are at present possible.

### *Statistics*

I had hoped, on visiting Kerala, to obtain statistics, say, on the yield of copra from each of several hundred trees over a period of ten years. I was unable to obtain such figures, even for the numbers of nuts. It appears that they exist for the Indian West Coast breed, but have not been adequately analysed. If nut number is counted, one of the first needs is to discover for how many years one must do so to get a reasonable estimate of a tree's performance in later years. It may be found that some trees reach their maximal yield much earlier than others. Correlation analysis should be done in two distinct ways. On the one hand if data on the yields of, say, 100 trees over 15 years were available, the technique of serial correlation applied to each tree separately would presumably demonstrate a negative correlation between yields in successive years for some of the trees, which only fruit well in alternate years. It is important to know if this is a sharply defined character, how it is inherited, and whether it can be overcome by the use of fertilizers. Secondly correlations between the yields of trees in a group in different years should be worked out. Perhaps regression analysis would be better. The kind of question to be asked is this. "How accurately can we predict the yield of a tree in 1959 from a knowledge of its yields in the years 1953 to 1957 inclusive? Is there any serious advantage in using figures over ten rather than five years, or would less than five be sufficient?"

If we know the distribution of (say) ten-year yields for a group of trees we can ask what would be the increase of yield if we could arrange, by breeding, husbandry, or a combination, to get a group of trees whose average yield was as high as that the best ten per cent of the group. This, I think, gives us an idea of what might be attained within thirty years or so. Until members of a clone have been compared, we shall only be able to guess at how much of the observed variation is genetically determined.

Meanwhile statistics on the oil yield of individual trees are much to be desired. We have a precisely similar problem in the case of cows. Here the milk yield and butter percentage vary more or less independently and both are genetically determined to some extent. But the butter fat percentage seems to be much less dependent on diet than the total yield.

Only when we can assess the value of an individual tree by quantitative methods can we hope to get the utmost value from a programme of improvement by selective breeding.

### *Formal Genetics*

In most domestic animals and plants a number of characters are known which are inherited according to Mendel's laws, or some slight modification of them. Such characters are rarely of great economic importance, except that deviations from the norm of a breed are usually undesired. However, their study has more than paid for itself. Such characters should be studied in the coconut. Results obtained at Kasaragod, for example, were compatible with the view that the variety *spicata* is dominant over the normal, though they certainly did not prove it.

One point is perhaps worth making. A variety which is a "freak" in most environments may be most valuable in others. For example small-combed poultry are bred in Southern India to lessen the danger of bleeding during cock fights. The genes which reduce the comb size in these breeds have been transferred to high



laying breeds to avoid injury to combs by frost, both in U. S. S. R. and Canada. Genes which lessen the feathering characterise "fancy" breeds in temperate climates, but are found in tropical breeds which are kept entirely for egg and meat production. It is possible that some variants may prove to be particularly valuable in unfavourable soils or resistant to particular infections.

In the study of formal genetics two things are essential. First, the paternity of every plant must be known with certainty. Secondly all the progeny of a cross or a self-fertilization must be grown. If seedlings which do not grow rapidly or are in other respects below the usual form are discarded, formal genetics cannot be investigated.

### *Self-fertilization*

There are two rather distinct reasons why the effects of self-fertilization should be studied. In the first place the fact that it is known to depress vigour, as shown by Patel (1937) and others makes it highly probable that if fairly homozygous lines were produced by, say, three generations of self-fertilization, the progeny of a first cross between two such lines would not merely show greater vigour than either parent, but also more than the average random bred plant. This is sufficiently often so in maize to make this method economically valuable. Secondly, individual plants of an outbred species like the coconut are likely to be heterozygous for a variety of recessive characters. Most of these will only be of interest for formal genetics, but some may be of economic value.

However, by rejecting the slowly growing seedlings the majority of these recessives will be lost; and, what is more serious, the relatively homozygous plants, whose crossing might be economically valuable, will probably be lost too. The pure lines of maize whose crossing has proved of such value in the U. S. A., are mostly miserable looking plants which would be weeded out in any selection programme. It thus seems that so far the products of self-fertilization of coconuts are likely to be of little economic value; but this need not be the case in future if attention is paid to the principles of genetics.

### *Selection*

Until more work has been done to assess the performance of individual trees and to follow up the yield of trees, the yield of whose mother and father are both known, I am not convinced that we need accept the conclusions of Pieris (1937) and others as to the inefficacy of parent selection, which are based on selection of seed parents only. However, the heritability of yield is probably fairly low. Gangolly, Satyabalan and Pandalai (1957) seem to follow Pieris in placing more reliance on seedling selection. In view of the findings in Ceylon it would seem that parent selection may be more efficient in one population and seedling selection in another. It, therefore, seems desirable to confirm the efficiency of seedling selection under Indian conditions, and measure it, at least roughly, by growing say 30 seedlings which would have been rejected, for long enough to estimate their yields.

Harland (1957) stresses the possibility of finding trees most of whose progeny have a high yield. The difficulty of such a programme lies in the very large number of progeny which must be tested before such a "pre-potent" tree is identified with near certainty. I am glad to see that Harland's suggestion is being taken seriously in Kerala. It seems to me premature to lay down a programme of selection until the data which have, apparently, been collected, are subjected to statistical analysis, and set out in such a form that they can be examined by Geneticists with experience of organisms in which generations are shorter.

I think that a sharp distinction should be made between two programmes. On the one hand selection of a rough and ready kind may be practised without artificial pollination. On the other, a programme of a more scientific character, based on artificial pollination and including some breeding from trees of low yield, might be carried out at one or more stations.

### *The Dwarf Palm*

Gangolly, Satyabalan and Pandalai (1957) summarise the existing knowledge of the performance of dwarf



palms and their hybrids with tall. This does not include any information as to the genetic determination of dwarfness. I am told that some progeny of hybrids are to be seen at Nileshtar, but it does not seem to be known whether the character of dwarfness is mainly due to a single gene (which we may provisionally call *D*, since the heterozygotes *Dd* are intermediate between *DD* dwarf and *dd* tall, in some characters). There seems to be no doubt that in some important characters the hybrids are superior to their tall parents. If dwarfness is mainly due to a single gene the following question arises. Are the hybrids superior mainly because they are *Dd*, or is this superiority due to genes at many loci? If the former hypothesis is correct, then *Dd* X *dd* or *dd* X *Dd* should give about equal numbers of *Dd* and *dd*, and the former should be superior from an economic point of view. It would then be possible to introduce *D* into various races of Indian coconut. Until the necessary genetical information is obtained one cannot make further detailed suggestions.

### *Foreign Breeds*

A number of nuts of foreign breeds have been planted at Kasaragod, and results are awaited. It is perhaps unlikely, though not impossible, that any of the trees derived from them will prove superior to the local variety. It is much more likely that first generation hybrids of these breeds, either with Indian breeds, or with one another, may prove to be of value. Here again no sure conclusions can be reached unless the paternity of each plant is known. The fact that trees of a given breed do not do particularly well in Kerala does not prove that hybrids derived from them may not do so. If the hybrids are thought desirable it may or may not be found that later generations derived either from back-crossing or from the inter-crossing of hybrids, will be of value. But it is most important that hybrid trees should not be discarded because they appear to be of little value. The desirable characters of two breeds may disappear in the first cross, but in later generations plants may appear which combine them or show new desirable characters. It will be seen that we have to ask a number of distinct

questions, that the answer to one gives little guidance concerning the answer to another, and that experiments should be planned to answer as many as possible.

### *Conclusions*

I must thank Dr. P. J. Gregory for permitting me to visit Kayangulam and Kasaragod. I am fully aware that research of any kind on coconuts must be a slow process at best. Just for this reason the methods used must be as efficient as possible. If an experiment on *Drosophila* can be completed in 20 weeks rather than 30, it may not be worthwhile taking the trouble needed to accelerate it. It is worth taking a lot of trouble to reduce the time needed to find out something about coconuts from 30 years to 20. This is likely to be achieved by the fullest possible use of statistical and genetical techniques. I have also suggested some other questions whose solution should not be too difficult and which might be of economic value.

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(Work on breeding of coconuts was commenced in India at Kasaragod on a very small scale since 1922. In 1937, under a research scheme financed by the Indian Council of Agricultural Research, some further breeding work was undertaken. These were necessarily of a preliminary and exploratory nature. In 1947 the Indian Central Coconut Committee took over the Kasaragod Station and extended it by acquiring 100 additional acres of land and also established a separate section there for breeding work. The work done till that time was reviewed and in 1951 plans were drawn up to study in greater detail the different aspects of coconut breeding work such as selection, hybridisation between T x D and exotic varieties, optimum parental combination in T x D, study of mother palms and their progenies etc. The material obtained from these different studies have been and are being planted in the field for study in detail their performance. Coconut being a perennial crop which takes about 20 years to come to its normal bearing period it would naturally take a fairly long time for results to be obtained. The suggestions made by Prof. Haldane have been noted by the research staff of the Indian Central Coconut Committee and will be given due consideration in planning future work — *Ed. I. C. J.*)

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## ANNEXURE II

### **Report of the Expert Sub-Committee appointed by the Indian Central Coconut Committee for formulating a Breeding Programme for the Improvement of Coconut Palm.**

Arising out of the report of Professor Haldane on the working of the Central Coconut Research Station, Kayangulam, the Indian Central Coconut Committee appointed an expert Sub-Committee with the following membership for formulating a breeding programme for the improvement of coconut palm:—

- (1) Dr. S. M. Sikka,  
Additional Agricultural Commissioner  
with the Government of India — Chairman
- (2) Dr. V. G. Panse,  
Statistical Adviser,  
Indian Council of Agricultural Research,  
New Delhi.
- (3) Dr. K. C. Naik,  
Dean & Additional Director of Agriculture,  
Coimbatore.
- (4) Shri C. M. John,  
Ex-Director,  
Central Coconut Research Station,  
Kasaragod.
- (5) Dr. M. S. Swaminathan,  
Cytogeneticist,  
Indian Agricultural Research Institute,  
New Delhi.

Dr. Swaminathan, however, could not attend the meeting of the Sub-Committee. Dr. K. P. V. Menon, Director, Central Coconut Research Station, Kayangulam and Dr. K. M. Pandalai, Joint Director, Central Coconut Research Station, Kasaragod, were co-opted as members. Dr. P. J. Gregory, Secretary, Indian Central Coconut Committee, also attended the meeting of the Sub-Committee.



The Sub-Committee met at the Central Coconut Research Station, Kasaragod on the 15th April, 1959. Besides seeing the breeding work in progress at this Station, some of the members also paid a visit to the Station at Kayangulam to get first hand information on the work being done on physiological aspects and breeding for pest and disease resistance. The members also visited the Coconut Research Stations at Pilicode and Nileshtar (now belonging to the Government of Kerala State) and had occasion to examine the breeding material, which was built up when these stations were established by the Government of Madras, and is still being maintained. The Latin Square experiment laid out with progenies of mother palms having high, medium and low number of nuts was also seen. Unfortunately, this experiment, though very well-planned, had been laid out on an unrepresentative soil, with the result that very valuable data expected from it could not be gathered. The Sub-Committee felt that if something could be done even now to revive this experiment by improving the soil, it would indeed be worthwhile to do so.

Besides the opportunity of making an on the spot examination of the breeding work in progress at the above-mentioned research stations and of discussions with the local officers, the members of the Sub-Committee had the advantage of referring to the very valuable suggestions made by Professor Haldane in his note submitted to the Chief Minister of Kerala State and the very illuminating Bulletin entitled "The improvement of coconut palm by breeding and selection", recently published by Dr. Harland as a result of the appraisal of the work being done in Ceylon.

The general impression gained by the members of the Sub-Committee, after their visit to various research stations, was that breeding work on right lines had been initiated when the stations at Pilicode and Nileshtar were established. This work was not pursued fully after the change in the administrative control of these stations took place, nor did the Central Coconut Stations established by the Indian Central Coconut Committee

make use of the very valuable breeding material which had been built up as a result of the earlier effort. The Sub-Committee felt that if the material available at Pili-code could be made use of even at this stage, it would enable some good results to be achieved in a short time.

As regards the breeding projects to be undertaken at the Central Coconut Research Station at Kasaragod, the Sub-Committee felt that emphasis should, no doubt, be on such projects as would give tangible results within a short period. Nevertheless, the fact that the coconut palm takes 7 to 8 years for fruition after the initial planting should not totally rule out adoption of even long-range measures. Coconut palm is obligatorily cross-pollinated and all methods of breeding which have been successfully employed in other plants falling in the same category, even though they may take somewhat longer time, are bound to be very useful for the genetic improvement of this palm also. It would, therefore, be quite apt if a start with those methods is made simultaneously with the short-term methods, so that they can make their full contribution towards improving the coconut plant after the potentialities of simpler methods have been exploited.

In the light of the above observations the Sub-Committee recommended the following breeding programme to be taken up at the Central Coconut Research Station, Kasaragod.

- (1) *Introduction of different varieties from other coconut growing countries and assessment of their economic characters.*

The Sub-Committee felt that some action on this item has already been taken and varieties introduced from a number of foreign countries are currently under study at Kasaragod. Very valuable information has already been collected, in as-much-as a wide variation in the yield of nuts, copra content, percentage of female flowers and their setting percentage has been found between the varieties. However, there appears to be scope for further intensification of effort in this regard. It was noticed that only one or two plants of each of



the exotic varieties have been raised at the Research Station. This number is not adequate to get a true idea of the economic characteristics of the varieties, nor can they be purposefully utilised for supplying their seednuts to the coconut growers. There is thus need for import of a larger number of seednuts of at least those varieties which have been found to be promising in preliminary observations, so that replicated progeny-row tests can be carried out with them and also isolated blocks of each variety can be raised, which will enable collection of their seed nuts by the process of "sibbing" for further propagation.

The Sub-Committee felt that, if this project is properly handled, it could furnish very valuable material for direct introduction immediately, as will be seen from the following data collected at Kasaragod.

| Variety     | Yield of<br>Nuts (No.) | Cora content<br>Per nut (oz) | Total annual<br>yield of copra<br>(lbs) |
|-------------|------------------------|------------------------------|-----------------------------------------|
| Fiji        | 110.1                  | 7.26                         | 51.3                                    |
| New Guinea  | 90.4                   | 7.28                         | 40.7                                    |
| Strait      |                        |                              |                                         |
| Settlements | 127.2                  | 7.40                         | 59.6                                    |
| Local Tall  | 72.5                   | 5.6                          | 25.7                                    |

## *)2) Selection of mother palms and their progeny testing.*

For making superior planting material available to the coconut growers, the main emphasis is on supply of seed nuts from mother palms which have been selected at the Coconut Research Station, Kasaragod, and in the farmers' fields on the basis of their apparent high yield of nuts. The results obtained in Ceylon have shown conclusively that (i) high yield is not transmitted by a mixed group of offspring from apparently highyielding mother palms exposed to natural crossing; (ii) selected seedlings from high-yielding palms can be very little better than those from low-yielding ones and (iii) seedlings from low-yielders can be superior to those from apparently high-yielders. From these results, it is to be concluded that the emphasis should shift from

mere nut selection to isolation of real genetic transmitters (called prepotents by Harland). In this connection, it is to be recognized that if single mothers are crossed with X fathers, the yield of such progenies will fall on a normal curve, with the very rare high transmitters occupying the upper end of the curve. In other words, given a sufficiently high number of progenies from open pollinated mothers, it should be possible to arrange them in order of yield and pick out mother palms, which in spite of having been indiscriminately pollinated by miscellaneous males, are sufficiently possessed of dominant yield factors to ensure that their offspring are also high-yielding.

Just as the progeny of a single mother palm may be superior, it is evident that the reverse situation also holds good, namely that once female transmitters are identified, their pollen can be used on phenotypically high-yielding mothers, thus making a very large quantity of good planting material available in a very short time. It might be mentioned that the process of identifying male transmitters can be speeded up by the use of dwarf palms as females. These "dwarfs" come into bearing very early, so that using a number of dwarfs as female parents, each bunch can be pollinated by a different high-yielding "tall" male. Since the dwarfs are self-pollinated and their progeny reasonably homogenous, the progenies of single bunches on a palm, each from a different male, can be studied to identify the most prepotent males.

It would thus appear that arranging of progeny-row tests for selection of good male and female transmitters needs to be given a high priority, as the question of supplying elite planting material, improved in true genetic sense, depends entirely on them. Unfortunately, this item has not so far received the attention it deserved.

(3) *Study of crosses between exotic and Indian varieties using selected "tall" mother palms.*

This item is proposed for exploiting the "genetic diversity", which often manifests itself in greater vigour



in inter-variatal and inter-racial crosses. For success of the project, it is necessary that only such palms of the local "tall" variety are used for hybridisation as have been proved to be good transmitters. Though much work on this aspect has not yet been done, the preliminary data collected from progeny rows shows that progeny No. XI/N.E. 3 would be quite suitable for use in grosses as it gave an average yield of 104.4 nuts over a 5-year period (1954-58) as compared to 95.0 nuts of the parent plants.

If planting space permits, the grosses may be made reciprocally and one or more replicated progeny-row tests laid out with the hybrid nuts for valid comparison of their yield and other economic characters.

#### (4) *Study of T x D crosses.*

The usefulness of T x D crosses has already been demonstrated by the work done during the past several years. However, the snags which have been noticed in handling this material are: (i) the "talls" used for crossing were randomly selected plants without knowing their genetic transmissibility and (ii) although a number of dwarfs, varying widely in their morphological characters are available, only one or two of them have been employed in the breeding programme. Due to undefined nature of the "tall" parent, the progenies of T x D crosses have generally exhibited a wide variation in the yield of nuts and other economic characters, thus reducing to a large measure their usefulness. The work in this item needs to be systematised by (i) using only those talls as female whose transmitting power has been well established (e. g. progeny No. XI/N.E. 3 referred to in item (3) above), (ii) using all the available dwarfs in crosses with the selected "talls", and (iii) laying out replicated progeny-row tests with the hybrids so obtained. It is felt that if systematic work is initiated on these lines, it will lay the basis for a sound programme under which F1 seed nuts of the most prolific T x D combination could be produced each year for supply to the coconut growers.

(5)<sup>1</sup> *Improvement through paired crosses of selected talls.*

The value of this method in tree breeding has been well demonstrated by Harland. After good male and female transmitters have been identified, they could be used for crossing in pairs to give more uniformly high-yielding offspring than could be attained by any other breeding method. The particular advantage of this method is that the elimination rate of seedlings in the nursery is considerably reduced, as the paired crosses are bound to give a high percentage of good seedlings. The method has thus immense possibilities, though it is more time-consuming than other methods.

(6) *Evolution of inbred lines and making of single crosses*

The value of evolving inbred lines in a cross-pollinated plant like coconut is too obvious to need any special emphasis. Attempts have no doubt been made in the past to evolve such lines, but they were mostly considered as useless due to inbreeding depression which most of them exhibited. It appears, however, that the point has been stretched a little too far, as the possibility of different varieties of coconut responding differently to selfing cannot be completely ruled out. The following data collected at the Agricultural Station, Pilicode is very illuminating in this connection:—

| Parent No. | Average yield of<br>natural progeny | Average yield of<br>selfed progeny |
|------------|-------------------------------------|------------------------------------|
| 1/58       | 43.3                                | 34.3                               |
| 1/108      | 41.3                                | 41.1                               |
| 1/129      | 33.3                                | 34.0                               |
| 1/174      | 67.9                                | 46.0                               |
| 1/103      | 46.4                                | 24.0                               |
| VI/4       | 42.2                                | 30.0                               |
| VI/97      | 50.1                                | 36.8                               |
| I/148      | 24.7                                | 36.9                               |
| IV/94      | 34.0                                | 18.0                               |
| VI/116     | 70.1                                | 46.5                               |
| VII/146    | 34.8                                | 53.6                               |



It will be observed that, while most of the progenies exhibited quite marked depression in yield on selfing, in a few (e. g., I/108, I/129, I/148, VII/146) progenies there was no obvious reduction. It would thus appear that, if sufficiently large number of progenies are handled, the chances of spotting a progeny, which retains its yield and vigour on selfing, are not remote. Once this is achieved, it will go a long way in solving the problem of improved planting material, as the inbred line would be reasonably uniform in yield and other desirable characters.

Even if inbred lines equal to open-pollinated ones in vigour and yield are not realised, they would at least be useful for the exploitation of hybrid vigour by making single crosses. The concept of "early testing", which has been proved to be very valuable as a result of the studies made on maize crop, could be taken advantage of in making single crosses even after one or two successive selfings, since it is known that about <sup>one</sup> of the deleterious recessives get eliminated by two selfings. Thus, despite the fact that selfing process would involve a long period, it would still be worthwhile to initiate this line of work as a long-term measure of improvement.

It might be mentioned that a number of inbred lines, evolved as a result of the work initiated by the Madras Department of Agriculture at Pilicode, are still being maintained at that station. For speeding up work on single crosses, advantage could immediately be taken of these lines. It is suggested that cyclic crosses between all the available lines be made and a progeny-row test laid out for selecting the lines which have the highest specific combining ability.

#### (7) *Study of 3-way and double crosses*

The Sub-Committee during its visit to the Research Station at Nileshtar observed that the following crosses between dwarfs had been made some time ago and are still being maintained at the station:—

##### (i) L. O. X G

- (ii) L. S. X G
- (iii) Java X G
- (iv) Andaman O X G

It would be useful to utilise the above material in making 3-way and double crosses, which are expected to show marked hybrid vigour. For 3-way crosses, some selected "talls" of proven transmitting power as well as varieties like Gangabondam, Fiji, New Guinea, Strait Settlements, etc., which have been proved to be high-yielders, besides possessing other desirable characters, should be utilised. The hybrid material obtained from 3-way and double crosses should be sown in a replicated progeny-row test for assessing the value of different hybrid combinations.

(8) *Introduction of spicata character in the local "Tall" variety.*

In the variety *spicata* described by Jacob (1941), the character of masculinity was seen to be least expressed. This variety is reported to have not more than 50 male flowers as against the mean number of about 6,000 met with in ordinary varieties. It would be useful to breed this character into the local tall variety, so as to build up a tree in which the inflorescences are branched, as in the ordinary tall variety, but the flowers borne on it are largely female. If such a form could be built up, it would greatly facilitate production of hybrid nuts at practically no extra cost.

(9) *Breeding for pest and disease resistance.*

It was noticed by the Sub-Committee that the control of major pests and diseases of the coconut palm is being attempted only by use of insecticides and pesticides and that the question of breeding resistant varieties has been totally ignored. Even a collection of coconut varieties has not been maintained at the Research Station at Kayangulam for evaluation of their resistance, nor has any attempt been made to evolve suitable techniques for the creation of epiphytotics of the important diseases and pests. In view of the Sub-Committee it is necessary



to undertake studies on these aspects, so that the possibilities of finding out resistant varieties are fully explored. The approach to the problem should include:—

- (a) Maintenance of a collection of all the available varieties of coconut, both Indian and foreign, at the Central Station at Kayangulam.
- (b) Assessment of their resistance under natural as well as controlled conditions after working out techniques for creation of epiphytotics.
- (c) Study of plant characters which might be associated with pest or disease resistance.

(10) *Study of correlations between different characters.*

These studies should have three objectives, namely, (i) determination of correlations between seed and seedling characters with the yield of nuts per tree, (ii) establishment of relationship between early and late yields and (iii) analysis of yield components with a view to working out of suitable selection indices. Work on some of these aspects has been done in the past and results of value have been obtained. The Sub-Committee, however, felt that the studies need to be made much more comprehensive. What matters is not the magnitude of the correlation coefficient, but the extent to which varieties deviate from the linear relationship. A high weight of copra per nut in a husked nut of medium size is probably the best combination to go far, although our present knowledge does not enable us to say what the optimum values of these characters should be. Further, detailed studies are also necessary on the high-yielding palms, especially on the relationship of copra per palm to number of nuts and weight of copra per nut. Several other similar relationships have to be worked out.

(11) *Induction of haploidy and development of genetically pure forms through chromosome doubling of haploids.*

The value of haploids for building up genetically pure forms in one step has been well recognised. The methodology of haploid induction is now fairly well known. Haploids occur sometimes as one member of a

pair of twins, though whether this occurs in the coconut is not yet known. This point needs investigation. Other methods comprise (a) use of X-rayed pollen, (b) use of old pollen, (c) use of pollen of another species, usually in the same genus. It is suggested that the efficacy of these methods should be investigated as an important long-term project.

(12) *Studies on vegetative reproduction of coconut palm.*

These studies should include (a) exploitation of the suckering habit which is exhibited by some coconut palms. In this case, it has to be established that the suckering habit is transmitted from one generation to the other, (b) making use of vivipary, which has been reported in some coconut palms by Narayana, John and Patel. The main difficulty to be surmounted in this case is that of successfully rooting the bulbils. This difficulty, however, should not be insuperable if modern horticultural techniques are employed. If success is attained with the rooting of bulbils, then crosses could be made between the viviparous type and the 'normals' in the hope of producing palms which show only a partial development of vivipary, simultaneously permitting vegetative multiplication and high yield. It is also possible that vivipary may be due to heterozygous dominants. If so, the character could be transmitted to a large number of offspring. (c) Exploitation of polyembryony, which phenomenon is quite frequent in coconut. In this case, the genetic basis of the phenomenon has not been worked out. If inherited, the tendency to produce more than one embryo could be increased by selection. (d) Possible induction of buds from the leaf petiole. It has been established in some plants that a leaf will root when placed in a suitable medium but will not normally form a bud. If however, the petiole is wounded, an adventitious bud may be formed on the cut surface. This method is being experimented with in Ceylon. (e) Possible induction of adventitious buds. This may be tried by cutting a palm to a height of say 3 feet from the ground, plastering the cut surface with heteroauxin and covering with polythene. It is remotely possible that buds may



develop from the surface, in which case the first step would be to root the palm 10 feet from the crown (technique for this has been worked out at the Central Coconut Research Station, Kayangulam), transfer it elsewhere and then try to induce buds to form on the 3-foot stump.

It must be admitted that the above -mentioned investigations are time-consuming and could be taken up only as a side line.

(13) *Establishment of a progeny orchard of the local tall variety.*

The need for the selection of well-tested male and female transmitters of the local tall variety has been referred to under item (2) above. After such plants have been selected, it would be desirable to establish a progeny orchard with them in an isolated forest area, so as to prevent vicinism of these plants by mongrel types. This orchard will serve as the nucleus for the supply of mother seednuts to all the coconut growing States where they could be propagated and multiplied further in similar progeny orchards. While a sufficient number of well-tested transmitters are not likely to be available immediately for setting up this progeny orchard, a start could be made by pooling the seednuts of a few outstanding trees marked out at the Central Coconut Research Stations at Kasaragod, Nileshwar or Pilicode. If thorough roguing is done in the progeny of these seednuts after the trees come to bearing stage or even earlier on the basis of known undesirable traits, the crossing will be restricted to selected plants which are finally retained. These plants could be replaced gradually by the selected "transmitters" through under-planting, as and when they become available.

Summarising, the breeding programme of the Central Coconut Research Station should include the following items:-

1. Introduction of different varieties from other coconut-growing countries and assessment of their economic value under Indian conditions.

2. Isolation of pre-potent high-yielders of the local tall variety by:—
  - (a) Comparison of a large number of open pollinated progenies.
  - (b) Crossing high-yielders by a group of selected dwarfs.
3. Study of crosses between geographical races for possible utilization of hybrid vigour.
4. Study of T X D crosses, using all available dwarfs.
5. Study of paired crosses of selected "talls" of proven transmitting value.
6. Evolution of inbred lines and selection of lines showing low inbreeding depression.
7. Study of "single crosses" between inbred lines for exploitation of hybrid vigour.
8. Study of 3-way and "double" crosses, using the single crosses of "dwarfs" available at Nileshtar.
9. Introduction of spicata character in the local "tall" variety.
10. Breeding for pest and disease resistance.
11. Study of plant correlations, including (a) relationship of seedling characters with adult characters of value; (b) study of relationship of weight of copra per palm to number of nuts, nut weight and weight of copra per nut with the objective of determining optimum values for selection; (c) relationship of early and late yield of nuts in different trees and (d) determination of components of yield.
12. Induction of haploidy and development of genetically pure lines through chromosome doubling of haploids.
13. Studies on vegetative reproduction of coconut palm.
14. Establishment of a progeny orchard of the local "tall" variety.

It might be mentioned that most of the items of work suggested, here, involve laying out of well-planned progeny tests. The Sub-Committee recommended that the



advice of Dr. V. G. Panse, Statistical Adviser, Indian Council of Agricultural Research, should be taken in planning of those experiments.

## APPENDIX XV

### Secretary's Note

*Subject No. 36*      Proceedings of the Coconut Nursery Officers' Conference held at Mangalore in May 1959.

The Indian Central Coconut Committee at its last meeting held in January 1959 had considered a suggestion of the Kerala Government that a Conference of coconut nursery officers might be held, and decided that such a Conference be convened within the next 5 or 6 months at Kasaragod or Mangalore. (*Vide* Subject No. 46 of the Proceedings of the 26th meeting),

Accordingly a Conference of Coconut Nursery Officers was held at Mangalore on the 20th and 21st May, 1959. A copy of the Proceedings of that Conference is attached to this note.

The Sub-Committee may consider the recommendations made by the Conference and decide whether they may be approved.

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### **Proceedings of the Coconut Nursery Officers' Conference Held at Mangalore on the 20th and 21st May, 1959**

*Proceedings of the Session Held on Wednesday the 20th May, 1959.*

The session was held in the St. Aloysius College Hostel, Mangalore at 12 noon and the following were present:-

1. Shri C. M. John (Chairman)
2. Shri. P. M. Kochappa Menon, Deputy Director of Agriculture, (Coconut Development), Kerala State.

3. Shri. P.A. Mohamed Ibrahim, Assistant Oilseeds Specialist, Pattukottai (Madras).
4. Shri. N. Gopalkrishna, Horticulturist, B. S. Poon 5.
5. Shri. D. P. Lakshminarasimhaiya, Senior Assistant Botanist, Bangalore.
6. Shri. A. P. Anandan, Superintendent, Agricultural Research Station, Nileshtar.
7. Shri. V. K. Neelakanta Pillai, Nursery Assistant, Vaikom.
8. Shri. A. Padmanabhan Thampi, Superintendent, Regional Coconut Research Station, Neyyattinkara.
9. Shri. M. Achutha Menon, Coconut Nursery Assistant, Tikkoti.
10. Shri. M. Kochunni Menon, Block Development Officer, Talikulam.
11. Shri. T. Balakrishna Menon, Coconut Nursery Assistant, Kozhinjampara, Palghat.
12. Shri. P. K. Nambiar, Agricultural Demonstrator Pallur, Mahe.
13. Dr. K. P. V. Menon, Director, Central Coconut Research Station, Kayangulam.
14. Dr. K. M. Pandalai, Joint Director, Central Coconut Research Station, Kasaragod.
15. Shri. M. M. Krishna Marar, Agronomist, Central Coconut Research Station, Kasaragod.
16. Shri. K. N. Sahasranaman, Central Coconut Research Station, Kayangulam.
17. Shri. P. Chami, Central Coconut Research Station, Kasaragod.
18. Shri. K. Shambu, Central Coconut Research Station, Kasaragod.
19. Dr. P. J. Gregory, Secretary, Indian Central Coconut Committee, Ernakulam.

*Invitees*

20. Shri. K.G.S. Bhandari, Someshwar, Kotekar P.O.



21. Shri. K. Sanjiva Shetty, State Pepper Development Officer, Mangalore.
22. Shri. K. Radhakrishna Rao, Fruit Assistant, Model Orchard-cum-Nursery, Mangalore.
23. Rao Bahadur K. T. Alwa,

Mr. C. M. John was unanimously elected as Chairman of the Conference.

Welcoming the delegates and invitees present at the Conference, Dr. K. P. V. Menon, Director, Central Coconut Research Station, Kayangulam, spoke as follows:-

*Gentlemen,*

It is my very pleasant duty to extend our warm greetings and cordial welcome to all those who have assembled here in response to our invitation. It is indeed very gratifying to note that two ex-members of the Committee, Messrs. Alwa and Bhandari, have taken the trouble to grace this occasion with their presence. They are experienced in coconut work and will certainly be of very great help to us and I am sure we will profit by their experience.

Most of the important coconut growing States have been represented at this Conference.

On behalf of the Committee I extend a very warm welcome to all those present here. This Conference is the third of its kind. We had two Conferences, both held in 1949 and the third is now being held in Mangalore after 10 years. I do not know for what reasons these Conferences have been stopped. The two Conferences in the past did serve a very useful purpose. I am glad that this has been revived and that this will be a regular feature of the activities of the Committee. In India it has been calculated that we require about 11.88 lakhs of seedlings by the beginning of the 3rd Five-Year Plan. To meet this we would require 9.53 lakhs of seedlings for under-planting and 2.35 lakhs for the extension of new areas. Against this, we have now 69 nurseries working in different States of India. The target of production is 7.35 lakhs of seedlings. Against this target in

1957 - '58 we produced just under 3 lakhs of seedlings. This would give an idea, to what extent we fall short of our requirements. Of all aspects of coconut development work, the distribution of quality seedlings, perhaps occupies the most important place. In some of the nurseries it is no secret that the quality of seedlings has not been up to the standard. Therefore, it is the object of this Conference to find out why we have not been able to keep up to the standard in some of the nurseries.

I hope the officers concerned will freely give their views here so that we may have an opportunity of discussing them here. We are really fortunate today in having Mr. C. M. John to preside over the Conference. I might say that he is the foremost coconut worker in India. He has worked on this crop for two decades. The improvements that we are now trying to adopt are based either on the results of his researches or the researches done under his direction. We are really fortunate that he is here with us today, keeping aside his other duties, to preside over these deliberations. I would now invite Shri John to preside over the function.

Then the Chairman spoke as follows:-

Gentlemen,

Dr. Menon, Director of Central Coconut Research Station, Kayangulam has very briefly drawn your attention to the great importance that has to be bestowed upon the distribution of good quality seedlings to improve our national economy.

I accepted the invitation not knowing that Shri Bhandari, our ex-member would be here. Probably he will have more knowledge about nursery work than I have and with apology I have accepted this invitation to preside over the deliberations.

Now with these few words let us go on with the various items of the Agenda.

The Conference next discussed the various subjects that had been submitted for consideration and framed draft recommendations.



**Proceedings of the session held on Thursday  
the 21st May, 1959**

The Conference met at 9.30 A. M. at the St. Aloysius College Hostel. The following were present:—

1. Shri C. M. John, Chairman.
2. Shri P. M. Kochappa Menon, Deputy Director of Agriculture (Coconut Development), Kerala State.
3. Shri P. A. Mohamed Ibrahim, Assistant Oil-seeds Specialist, Pattukkottai (Madras).
4. Shri N. Gopalkrishna, Horticulturist to Government, Bombay State, Poona-5.
5. Shri D. P. Lakshminarasimhaiya, Senior Assistant Botanist, Bangalore.
6. Shri M. Kochunny Menon, Block Development Officer, Talikulam.
7. Shri A. P. Anandan, Superintendent, Agricultural Research Station, Nileshwar.
8. Shri V. K. Neelakanta Pillai, Nursery Assistant Vaikom.
9. Shri A. Padmanabhan Thampi, Superintendent, Regional Coconut Research Station, Neyyattinkara.
10. Shri M. Achutha Menon, Coconut Nursery Assistant, Tikkoti.
11. Shri T. Balakrishna Menon, Nursery Assistant, Kozhijampara.
12. Shri P. K. Nambiar, Agricultural Demonstrator, Pallur (Mahe).
13. Dr. K. P. V. Menon, Director, Central Coconut Research Station, Kayangulam.
14. Dr. K. M. Pandalai, Joint Director, Central Coconut Research Station, Kasaragod.
15. Shri M. M. Krishna Marar, Agronomist, Central Coconut Research Station, Kasaragod.

16. Shri K. N. Sahasranaman, Farm Assistant, Central Coconut Research Station, Kayangulam.
17. Shri P. Chami, Fieldman, Central Coconut Research Station, Kasaragod.
18. Shri K. Shambu, Fieldman, Central Coconut Research Station, Kasaragod.
19. Dr. P. J. Gregory, Secretary, Indian Central Coconut Committee, Ernakulam.

*Invitee*

20. Mr. K. G. S. Bhandari.

The Conference accepted the following recommendations that had been drafted the previous day:-

*Subject No. 1. Starting of new nurseries.*

The Conference was of the opinion that new nurseries be encouraged to be started in cases where a particular region was not adequately served by the existing nurseries and that for this purpose suitable sites with good water supply and areas round about in which suitable mother palms were available, be selected. The Conference recommended the starting of an additional nursery in Quilon District and enhancing the target of production of the coconut nursery at Pattambi and suggested that as far as possible new nurseries be attached to existing Agricultural Research Stations.

*Subject No. 2. Staff of State nurseries.*

The Conference recommended that for nurseries with a production target of 30,000 seedlings the following minimum staff be provided.

1. One Assistant (Trained in coconut nursery work at the Central Coconut Research Station, Kasaragod.)
2. One Fieldman.
3. One Maistry.
4. One Watchman.

With regard to nurseries in the National Extension Service Blocks with a target of 7,500 seedlings, the following minimum staff was recommended:-



1. One Demonstrator or Fieldman.
2. One Nursery Mazdoor-cum-Watchman.

It was also recommended that the difference between the expenditure and receipts in the National Extension Service Block Nurseries be met by the Indian Central Coconut Committee.

*Subject No. 3.* Supervision and control of nurseries.

The Conference recommended that the Agricultural Assistant concerned be required personally to check all the mother palms selected by the nursery staff and that appropriate powers be delegated to superior officers to check the progress of work in the nurseries from time to time.

It was also recommended that the nursery work be regionalised for purposes of supervision under the overall control of the Coconut Development Officer of the State concerned.

*Subject No. 4.* Certified nurseries.

The Conference was of the view that the organisation of private nurseries was desirable in certain coconut areas and that a questionnaire be issued to collect information on the various aspects of private nurseries before appropriate rules are formulated. The Conference recommended the appointment of a Special Sub-Committee for this purpose.

*Subject No. 5.* Administrative difficulties, delays etc.

Since most of the members present felt that the work in the nurseries could be done more smoothly and efficiently, if administrative delays which at present retarded progress were eliminated, the Conference urged that such bottlenecks be minimised to the fullest extent possible so that work in the nurseries could proceed more satisfactorily.

It was brought to the notice of the Conference that the carrying out of the timely operations in the nursery is being hampered due to the non-receipt of sanction for expenditure in proper time. The Conference, therefore,

recommended that appropriate powers of sanction may be delegated to officers who are placed in immediate control of coconut nurseries. To guide the sanctioning authority, a workable schedule of rates for routine expenditure may be arrived at where this is not available at present.

*Subject No. 6.* Allotment of seedlings from nursery at Central Coconut Research Station, Kasaragod.

The Conference recommended that as there was a good demand from the various States for seedlings produced at the Central Coconut Research Station, Kasaragod the seedlings be supplied to the applicants from various States on the basis of indents received on an equitable basis and that an advertisement be published in the Committee's Bulletin regarding the availability, cost, etc., of the seedlings sufficiently in advance of the planting season.

*Subject No. 7.* Marking of mother palms and seednuts.

The Conference recommended that all mother palms be marked with a black ring in tar about two to three inches wide at about a height of 5 to 6 feet and an upward arrow mark above the ring together with the serial number of the palms.

Suggestions regarding the maintenance of mother palm register are given separately.

The Conference suggested that the cheapest method of marking seednuts was to make the required mark on the freshly harvested nuts with a sharp nail and that the possibility of devising a suitable stamping machine be investigated at the Central Coconut Research Station, Kayangulam.

*Subject No. 8.* Nursery practices.

a) *Collection season.*

Since the necessity to procure large numbers of seednuts from the existing mother palms had arisen, the Conference was of the view that the possibility of



collecting seednuts outside of the present collection season February - May be investigated. These investigations may be conducted at the Regional Coconut Research Stations and any other representative centre with nuts harvested during different months of the year.

The Conference recommended that a scheme of investigation on this aspect be drawn up by the Agronomist, Central Coconut Research Station, Kattaragod and supplied to the State Departments of Agriculture.

b) *Method of planting seednuts.*

The Conference was of the opinion that there was hardly any significant difference between the vertical and horizontal methods of sowing seednuts. Any of the two methods may be adopted in relation to local conditions.

c) *Manuring seedlings.*

The Conference while being of the opinion that seedlings raised in a fairly good type of soil would be healthy and so would not need any manuring, recommended that in areas where due to soil or other environmental conditions, the seedlings showed yellowing and were not attractive to the cultivators the following procedure be adopted:-

- 1) That all the undesirable seedlings be removed from the nursery.
- 2) That only seedlings which were fit for distribution be retained.
- 3) That light dressings of ammonium sulphate or urea be given to the nursery beds with the onset of rains so that the appearance of the retained seedlings may improve.

The Conference also recommended that in highly sandy porous soils, red earth or other soil be added to the nursery beds to increase the water holding capacity. This should not, however, result in white ant attack.

d) *Growth studies.*

The Conference recommended that based on the girth measurement, seedlings could be selected even when they were six months old and distributed to those who desired to plant them in February - March.

*Subject No. 9.* Issue of Mother Palm Cards and maintenance of Mother Palm Registers.

The Conference approved of the proforma for maintaining the mother palm registers as given in the Nursery Officers' Manual. The Conference also recommended the issue of mother palm cards to the owners of outstanding mother palms in the following proforma:-

**Form of Mother Palm Card**

This is to certify that palms, the particulars of which are given below, are good mother palms and can be used for propagation purposes.

Situated in S. No.

| belonging to |             | Village     |              |
|--------------|-------------|-------------|--------------|
| Sl. No. of   | Brief       | Approximate | Location in  |
| Mother palm  | Description | Age         | the garden * |
| 1.           |             |             |              |
| 2.           |             |             |              |
| 3.           |             |             |              |
| 4.           |             |             |              |

Signature and designation of the authority issuing the certificate.

*Subject No. 10.* Indent and supply register.

The Conference suggested that in the proforma for the indent and supply register given on page 20 of the Nursery Officers' Manual, columns be provided to show the dates of indent and supply.

The Conference further recommended that a follow-up register be maintained in all the nurseries and that at least six plots, each containing not less than 25 trees, be maintained in six representative areas.

\* Give sufficient directions with reference to some fixed points to facilitate quick spotting and a check up.



These follow-up registers would give information on important cultivation practices such as intercultivation, manuring, spraying etc., done from time to time. It was recommended that the owners of these plots be advised to carry out the various improved methods in these plots.

*Subject No. 11. Procurement of seednuts.*

In cases where more than one agency was concerned with the purchase of seednuts from the same locality, the Conference recommended that the purchasing officers concerned should come to an understanding regarding the purchase price and premium to be paid to the garden owners to avoid unhealthy competition.

*Subject No. 12. Increasing recovery percentage in nurseries.*

The Conference was of the view that in order to increase the recovery percentage of good seedlings in the nurseries, greater care be taken to ensure that only mature and fully ripe seednuts were collected, that the selected nuts were transported to the nursery sites and stored in sand in the quickest possible time and that they were sown in proper time and shading and mulching were provided during summer.

In areas where nematodes and white ants caused destruction the nursery beds should be treated with suitable insecticides sufficiently in advance of the planting season and also during the growth of seedlings in the nursery.

*Subject No. 13. Provision of irrigation facilities on leased nursery sites.*

The Conference was of the view that where nurseries have to be started on leased sites in future, provision be made in the lease agreements to the effect that the owner of the land concerned would make good the cost of any permanent improvement effected thereon when the site was vacated.

*Subject No. 14. Standard expenditure on nurseries.*

The Conference recommended that the schedule of standard expenditure given in the annexure be adopted,

provided it was modified, if necessary, according to local conditions.

*Subject No. 15. Nursery Name Board.*

The Conference recommended that every nursery be supplied with a name board indicating details such as the number of seedlings available for supply, the cost of seedlings ex-nursery, the working hours of the nursery etc.

*Subject No. 16. Frequency of Nursery Officers' Conference.*

The Conference recommended that the Nursery Officers' Conference be held ordinarily once in two years.

In concluding the proceedings, the Chairman spoke as follows:—

We met these two days to pool our ideas and difficulties with regard to the running of coconut nurseries.

Our suggestions will help the running of the nurseries more efficiently.

Dr. Menon, yesterday drew our attention to the necessity for producing more seedlings. This, as you know, is an all-important item of work.

Dr. Menon and myself, who were first appointed by the Committee to review the research work done on coconut in India and suggest ways and means for carrying out future work, in our joint report made the recommendation to the Committee that one of the most important items of work the Committee had to do was to organise coconut nurseries in the States to distribute quality seedlings. We were led to make this recommendation due to the fact that the nursery at the Kasaragod Research Station had a great reputation for the supply of good seedlings. However, the capacity of that nursery was very limited. We are glad that the Indian Central Coconut Committee gave great consideration to our recommendation and took on its agenda of work the starting of coconut nurseries at the first instance. I am glad that most of the State Departments of Agriculture have fully co-operated with the Committee and with a



minimum and modest staff we have been able to start nurseries for supply of quality seedlings. We are now faced with a deficit of coconut products in India, and the necessity to import copra. It is, therefore, our bounden duty to increase the production of coconuts. You know that coconut tree is called "Kalpavriksha" and it is our duty—be he the Coconut Development Officer, the Director, the Joint Director, the Secretary—to see that nursery work is carried out in a very fruitful and efficient manner. We have spent nearly 1½ days in our deliberations and we think we have come to very practical decisions which would enhance the efficiency and supply of quality seedlings to the farmers. I would say that the entire burden rests not on those officers who are in immediate charge of the nurseries. They must, however, realise that they have a duty to do their work most honestly. They must bestow great attention in the selection of mother palms, seednuts etc., and they must realise that this is a work which they do for the good of the country and the love of the coconut. Unless they do it sincerely nothing tangible would be achieved in our object. Don't think that you are there to satisfy the auditors or Inspecting Officers. You should not think that you are doing a salary work. It is a very important work because coconut is the mainstay of our people. It is actually a religious duty bestowed on you. I know there will be practical difficulties in going round to select mother palms, but they should not stand in your way. There is a lot of criticism about the quality of seedlings produced in the State nurseries. It is our duty to see that this kind of criticism is removed as early as possible. The reputation of the Kasaragod nursery can be achieved by the State nurseries also. You should realise that it is your duty to take great care in the selection of mother palms, collection of seednuts etc. Otherwise all your efforts and money will be wasted. You should realise the importance of this work and rise to the occasion and see that every farmer realises that the seedling supplied by you is of a better kind.

I am thankful to the Secretary, the Director, and the Joint Director for inviting me to preside over the

Conference. I might have in certain cases ventured to give some suggestions against your views, but it was with the best of intentions. I am glad that most of you have accepted my suggestions and helped me to make the Conference conclude in a successful manner.

The Joint Director, Central Coconut Research Station, Kasaragod, then delivered the following thanksgiving speech:—

Gentlemen,

We have come to a very successful conclusion of our deliberations. It is now my very pleasant duty and privilege on behalf of the Indian Central Coconut Committee to propose a hearty vote of thanks to all of you who have come here in response to our invitation to participate in our deliberations. It has been our singular good fortune to get guidance from Shri C. M. John who has been giving us his unstinted help and advice and inspiration in all attempts which we make towards progress in the matter of coconut research. I should also like to say that we have the feeling of a great amount of security and confidence in our work due to the guidance, inspiration and help which we are getting from Mr. John. Let me hope that in the future Conferences also we will have him to guide our deliberations. I would also like to thank Rao Bahadur K. T. Alwa, Sri K. G. S. Bhandari, Sri K. Sanjiva Shetty, and Sri K. Radhakrishna Rao for their kind presence and participation in this Conference. I should particularly refer to the help we have received from the State representatives M/s N. Gopalkrishna, D. P. Lakshminarasimhaiya and P. A. Mohamed Ibrahim. Last but not the least I must thank Mr. Kochappa Menon and his colleagues, for the contributions they have made in these discussions. I would also like to offer our vote of thanks to Rev. Fr. Castelino for placing this hall, lodge, the college hall and the projector at our disposal and making our stay here very comfortable. Lastly I would offer a special vote of thanks to all our colleagues for making this Conference a very brilliant success.

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## ANNEXURE

### *Schedule of rates for works connected with the coconut nurseries.*

|    |                                                                    |                                                                                     |
|----|--------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1  | Marking and numbering of mother palms.                             | 1 man for 50 trees Rs. 12 to Rs. 15 per 1000 excluding cost of tar and brush.       |
| 2  | Harvesting seed coconut and lowering seednuts.                     | According to the distribution of mother palms.                                      |
| 3  | Collection of seed coconut from the base of tree and heaping them. | Rs. 2.50 to Rs. 5.00 per 1000 (according to the distribution of mother palm.)       |
| 4  | Numbering of seednuts block-wise and tree-wise.                    | Rs. 2.50 per 1000 nuts.                                                             |
| 5  | Loading and un-loading seednut for transport.                      | Rs. 2.50 to Rs. 5.00 per 1000 according to the load.                                |
| 6  | Preservation of seednuts in sand.                                  | Rs. 5.00 per 1000.                                                                  |
| 7  | Preparation of land and formation of bed.                          | 3 men for heavier type and 2 men for lighter type of soil per 1000 nuts.            |
| 8  | Removal of nuts from the area of preservation.                     | 1 man per 1000 nuts.                                                                |
| 9  | Planting seed nuts.                                                | 4 men per 1000 nuts.                                                                |
| 10 | Weeding nursery beds.                                              | 1 woman per 1000 nuts for the 1st weeding and 1 woman for 1,500 nuts, subsequently. |
| 11 | Mulching the beds.                                                 | 1 man for 1000 nuts (mulching materials to be supplied).                            |
| 12 | Hand watering the beds.                                            | 1 man for 2,000 nuts.                                                               |
| 13 | Shading with cadjans and bamboo prop etc.                          | Rs. 25.00 per 1000 nuts for 1st year and Rs. 12.50 for subsequent two years.        |
| 14 | Lifting up ungerminated seednuts and heaping.                      | 3 men per 1000 nuts.                                                                |
| 15 | Plucking up rejected seedlings and heaping.                        | 1½ men for 1000 seedlings.                                                          |
| 16 | Lifting up quality seedlings.                                      | 1 man for 500 seedlings.                                                            |

## APPENDIX XVI

### Secretary's Note

*Subject No. 38.* Scheme for intensive cultivation and manuring of coconuts.

The President of the Committee in a note to the undersigned had observed as follows:—

“Japanese method of cultivation of paddy which is really a combination of all scientific techniques has yielded good result in food production. It is desirable that similar programmes of intensive cultivation and scientific practices should be laid down for other crops as well, such as coconut. The programme of cultivation would naturally vary from State to State and due regard should be taken of this fact.” Optimum spacing, optimum doses of fertilisers, time of irrigation etc., should be duly considered in laying out this programme”.

A draft programme for the intensive cultivation and manuring of coconut palms along scientific lines prepared by the Joint Director, Central Coconut Research Station, Kasaragod in consultation with the Additional Agricultural Commissioner with the Government of India is attached to this note (Vide Annexure I). The Additional Agricultural Commissioner had observed that it would be useful to have a month-wise calendar of operations for each State giving such details as times of sowing particular green manure crop, ploughing it under, times of application of fertilisers, method and time of planting particular shrubs for green manure, quantity of leaf to be added for mulching, quantities of clay or silt to be added, etc., etc.

Monthwise calendar of operations drawn up by the Directors of Agriculture, Kerala, Mysore, Madras, Andhra Pradesh, Bombay and West Bengal are attached (Vide Annexures II to VII). The Directors of Agriculture of Assam and Orissa have not yet furnished the information.

The Ministry of Food and Agriculture, Government of India to whom the programme prepared by the Joint



Director, was forwarded have pointed out that the intention is to draw up a concrete scheme of intensive cultivation for the different coconut growing States.

The Committee may now draw up suitable schemes for intensive cultivation and manuring of coconuts for each State.

The subject may be considered first by the Agricultural Research and Development Sub-Committee (Development and Extension Wing).

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## A N N E X U R E I

### Scheme for Intensive Manuring and Cultivation of Bearing Coconut Gardens

#### *Introduction*

The present production of coconuts in the Indian Union falls short of the country's requirements by about 25 to 30% and this deficiency is now being made up by imports from other countries. There is, therefore, urgent need to step up internal production in the shortest possible time and achieve self-sufficiency in regard to our requirements of coconut products. The only way to achieve this goal in the near future is to vigorously tackle the coconut gardens now in bearing as new plantations will take a number of years to reach the normal bearing stage. That improved methods of coconut cultivation will augment production substantially has been demonstrated beyond doubt by the researches done at Central Coconut Research Station, Kasaragod and other Research Stations on the west coast. It is true that similar information is not now available for the other important coconut regions such as Mysore, Madras, Andhra Pradesh, Bombay and Orissa, but there is no reason to believe that results will be different.

There are a number of improved practices each of which can by itself increase production somewhat but

simultaneous adoption of all the practices will give the maximum results in the shortest possible period. All the available useful information has been summarised below for the guidance of the growers as well as of the extension staff.

The recommendations have been drawn up under two broad headings viz., manuring, cultivation and other practices and control of pests and diseases. The former have been discussed with the soil type as the main basis as the responses to improved practices have been found to be largely influenced by the physical and chemical properties of the soil. The fact that the rainfall and its distribution and availability of the underground water supplies do make considerable difference in the behaviour of the same soil type is not forgotten and it is conceded that the recommendations are amenable to modifications in the light of the conditions obtaining in a particular area.

### **Manuring, cultivation and other practices**

#### **1. Loamy soil.**

This is the soil type on which coconut is being largely raised in India. In general the soil is fairly well drained but the fertility status is poor. Coconut palms growing in this particular soil type have been found to respond well to manuring and cultivation.

#### **Manuring.**

Any one of the manure mixtures given below may be applied according to availability and price.

| <i>Manures</i>              | <i>Per tree per year</i> |
|-----------------------------|--------------------------|
| Ammonium Sulphate           | 3 to 4 lb.               |
| Superphosphate or bone meal | 2 lb.                    |
| Muriate of potash           | 2 to 3 lb.               |
| or                          |                          |
| Groundnut cake              | 15 to 20 lb.             |
| Ash                         | 2 lb.                    |
| Superphosphate or bone meal | 2 lb.                    |

The manures may be applied broadcast and ploughed in if the garden consists of coconut palms only and the palms are planted not too wide apart. A better method



is to apply them in shallow basins dug round the base of the trees. Manuring should be done only when there is sufficient moisture in the soil and this period may vary from tract to tract, depending upon rainfall and its distribution. On the West Coast August-September is the normal manuring period. The manures may be applied in one dose but where rainfall is not quite dependable the dose may be split up into two halves and applied at appropriate times, taking advantage of the favourable conditions

### *Cultivation.*

Regular cultivation of coconut gardens is very important in any scheme designed to improve the production. The garden may be dug up with mammaty or ploughed once or twice a year or the soil heaped in mounds and levelled up later. The object of cultivation is to remove weeds and create soil mulch. Only the minimum number of cultivations that are required to attain the above objective need be done. Ploughing may be given once in August-September and for a second time in November-December. Where green manure crop is to be raised one ploughing may be necessary in April-May.

### *Green manuring.*

Loamy soils are in general poor in organic matter and hence this may be augmented by growing a green manure crop *in situ* and ploughing it in or by bringing in leaves from outside and applying at 50 to 100 lb. per tree per year. Any crop, preferably a leguminous one suited to the tract and season may be chosen. On the West Coast the green manure crops that may be grown *in situ* are *Crotalaria striata*, Sunnhemp, Cowpea or *Calopogonium mucunoides*. *Crotalaria striata* is sown broadcast in April-May adopting a seed rate of 20 to 25 lb. per acre and covered with a light plough. For Cowpea and Sunnhemp a seed rate of 50 to 60 lb. may be adopted and seeds sown by dibbling behind a country plough in June. *Calopogonium mucunoides* may be sown broadcast at 8 to 10 lb. of seed per acre and lightly covered. All the crops can be incorporated in August-September. For other States Sunnhemp is recommended. This may

be raised later in June-July or August-September. For West Bengal and Assam where coconuts are not being grown on a plantation scale green leaves may be brought from outside and applied at 50 to 100 lb. per tree. If available, cattle manure or compost may be applied instead of green leaves at about 50 lb. per tree.

Planting of quick growing green manure crops such as *Gliricidia maculata* along the borders of the coconut garden appears to be the most suitable method of producing at site sufficient green leaves for manuring purposes. This crop can be propagated by cuttings (preferably rooted) as well as by seedlings. Cuttings may be taken and planted in April - May in specially prepared beds to get them rooted and these may be transplanted in June-July in the field giving a spacing of 5' to 6' with the commencement of rains. Seedlings may also be raised and planted at the same time. In 2 to 3 years' time the plants can be pruned and the prunings applied in basins dug round the base of the trees.

Green manuring is to be done when there is sufficient moisture in the soil.

### *Husk burial.*

Burying of dry coconut husks in trenches 6' wide and 15" deep at 1000 husks per tree in between rows of coconut palms has been found to be a desirable practice in coconut gardens raised under dry system of cultivation. The benefit of one operation will last for five to six years. Husks may be buried in June-July. Where dry husks are available readily and cheaply this practice may be recommended.

### *Irrigation.*

Where rainfall is insufficient or where it is sufficient but badly distributed giving rise to long periods of drought, the palm will give better yields, if watered during the rainless season. It may, however, be stated that such trees might require irrigation every year. Stopping of irrigation in the middle is likely to cause a setback in productivity.



## 2. *Laterite and gravelly laterite soils.*

Large are as of coconut are met with in these soil types also. The soils are generally poor in all plant foods.

### *Manuring.*

The following manure mixture is recommended:-

|                   |     |            |
|-------------------|-----|------------|
| Ammonium sulphate | ... | 4 to 5 lb. |
| Bonemeal          | ... | 3 lb.      |
| Muriate of potash | ... | 2 to 3 lb. |

The manures may be applied in shallow basins dug round the base of the trees when there is sufficient moisture in the soil. August-September is the appropriate time of manuring.

### *Cultivation.*

When the surface soil is deep enough, ploughing may be done. Otherwise the area at least round the trees may be stirred with digging fork or pickaxes.

Since the above soil types are mostly met with in the interior along the slopes of hillocks or undulating lands it may be necessary to terrace the gardens properly before regular cultivation is commenced as otherwise soil erosion may develop. On sloping lands ploughing may be done on the contour.

### *Green manuring.*

Green manuring is beneficial in this type of soil also. As referred to previously either a suitable green manure crop can be grown and ploughed under or green leaves brought from outside and applied. The quick growing green manure bushes like *Gliricidia maculata* can also be raised on the borders of the plantations as a source of green plant material. Where compost or cattle manure is available in sufficient quantities, 50 to 100 lb may be applied instead of green leaves.

### *Application of common salt.*

There is a practice of applying 5 to 10 lb of common salt to the coconut palms in some areas. Though there is no evidence yet of its direct beneficial action on the

coconut palms there is reason to believe that common salt helps in the disintegration of laterite and making it more permeable to coconut roots. Hence application of salt to coconut palms growing on laterite soils is recommended.

### 3. *Sandy soil.*

Appreciable areas under coconut are met with in sandy soils along the sea coast and sometimes in the interior also. This soil is excessively drained, poor in plant food and subject to considerable drought during rainless periods. Where soil moisture conditions can be maintained either by artificial irrigation or through well distributed rainfall or from high water table, yields can be stepped up by the adoption of improved methods of coconut cultivation. Where drought conditions are of frequent occurrence and maintenance of soil moisture difficult the scope for improving production economically is very limited.

#### *Manuring.*

Some of the alternate manure mixtures that may be adopted in manuring trees growing on sandy soils are given below:—

| Per tree per year        |   |              |
|--------------------------|---|--------------|
| Cattle manure or compost | — | 100 lb.      |
| Wood Ash                 | — | 20 to 40 lb. |
| or                       |   |              |
| Fish guano               | — | 15 lb.       |
| Muriate of potash        | — | 2 to 3 lb.   |
| or                       |   |              |
| Prawn dust               | — | 15 lb.       |
| Muriate of potash        | — | 2 to 3 lb.   |
| or                       |   |              |
| Groundnut oil cake       | — | 15 to 29 lb. |
| Wood Ash                 | — | 20 to 40 lb. |
| Superphosphate           | — | 2 to 3 lb.   |

It is better to avoid purely inorganic forms of fertilisers as not much response has been seen to them in sandy soils. The manures may be applied in basins



dug round the base of the trees as mentioned in the case of other soil types. If possible the entire dosage may be given in two separate applications once in August-September and again in November-December depending upon rainfall distribution.

### *Cultivation.*

Being poor in fertility, weed growth or maintenance of mulch is not a serious problem. However, if weeds do grow cultivation may be done to eradicate them. A more important aspect in sandy soils is to prevent the formation of surface root system because then the trees are found to suffer severely from the effects of drought. Throwing the soil of the garden into mounds towards the end of south-west monsoon season and levelling them up later has been claimed to be a very beneficial cultural operation in coconut gardens in sandy soils. This may be systematically done.

### *Green manuring.*

Of all the soil types this is the one that requires green manuring to be done systematically. However, the scope of growing a successful green manure crop *in situ* is limited because of lack of soil fertility. The quick growing green manure crop of *Gliricidia* may be grown along the borders of the plantation as a source of green leaves. Otherwise outside sources may have to be tapped for it. Green leaves may be applied at 50 to 100 lb. per tree.

### *Carting of clay.*

Absence of finer clay particles in the soil is responsible for the porous nature and lack of moisture retaining power of the soil. Silt or clay carted from outside and incorporated into the sandy soil will in the long run improve the soil characteristics. Wherever possible this may be done as a long term measure of improvement. The quantity that can be applied will depend upon the cost involved in carting the material which again is influenced by the place where clay is available and the mode of transport. About 50 to 100 lb. may be applied per tree in summer months of March to May.

### *Mulching.*

The effect of drought is severe in sandy soils and in order to mitigate its effect mulching of the soil at least to a radius of 6' round the base of the trees may be done with dry leaves or other suitable material immediately after the cessation of the rains. About 25 dry coconut leaves may be required to mulch round the base of each tree. These may weigh from 300-450 lb.

### *Irrigation.*

Irrigation of coconut trees growing in sandy soils during summer or rainless period will greatly improve the productive capacity of the trees. In areas along the sea coast even sea water can be used for this purpose without any ill effects. In sandy soils irrigation facilities can easily be provided by the installation of filter points.

#### 4. *Alluvial soils and reclaimed soils of the backwaters.*

Alluvial soils are generally met with in the deltaic areas of rivers such as Godavari, Krishna, Cauvery etc., while reclaimed soils are mostly confined to the back water areas of Travancore and Cochin in the Kerala State. These soils are generally of above average fertility and may not show much of response to fertilization.

### *Manuring.*

The following manure mixture is recommended:-

|                             |     |            |
|-----------------------------|-----|------------|
| Ammonium sulphate           | ... | 2 to 3 lb. |
| Muriate of potash           | ... | 2 to 3 lb. |
| Superphosphate or bonemeal. | ... | 2 lb.      |

The manures may be applied in basins as referred to previously. The best time of application will be after the heavy rains of the monsoon are over.

### *Cultivation.*

Digging or ploughing may be done according to local practices.

### *Green manuring.*

The soils are generally rich in organic matter and green manuring as a routine measure may not be necessary. However green manuring or incorporation of



bulky organic manures like compost may help to open up the stiff soil. Crops such as Sunnhemp, or Pillipesara generally grow well in such soils.

### *Carting of sand.*

The physical characteristics of stiff clay soils can be improved by the addition of sand in appreciable quantities. This is being done with benefit and may be adopted wherever possible as a long-term measure of improvement. Sand may be carted and applied at the rate of 100 to 150 lb. per tree during summer months of March to May.

### **Facts to remember**

The utility of bulky organic manures such as cattle manure or compost and manures such as ash will depend upon the care bestowed in their preparation, storage and application. Materials exposed to rain for long periods will have practically no manurial value.

2. It is known that certain kinds of oil cakes are available cheaply in certain localities. They can be used as a source of nitrogen instead of ammonium sulphate but have to be applied at 20 to 25 lb. per tree.

3. There is no harm in adopting the manurial schedule shown against a particular soil type to others also. In the case of sandy soils, however, organic forms may be preferred to inorganics.

4. If it is found difficult to get individual manures and prepare mixtures in the garden itself, the growers may go in for coconut manure mixtures of guaranteed analysis manufactured by well known firms such as Parry & Co.

5. Wherever circumstances permit the growers can use the inter-space in the coconut plantation to raise short-term crops but care should be taken to see that the subsidiary crops are adequately and separately manured. The crops may not also be grown right up to the base of the trees. An area of 6 to 8' radius round the base of the trees must be kept vacant so that manuring the coconut palms can be done at the right time. The crops that may be raised differ from tract to tract depending upon local preferences and demand.

### *Control of pests and diseases.*

Pests and diseases affecting bearing coconut palms are responsible for considerable loss of production and unless they are kept under check the full benefit of other improved methods of coconut cultivation cannot be realised. Therefore a short account of the important pests and diseases with their control measures is given below.

#### *Pests.*

##### 1. *Rhinoceros beetle.*

This is one of the most destructive pests of the coconut palm and it is very common in all coconut areas. The adult beetle attacks the crown boring into developing leaves and flower bunches. The following are the control measures recommended:—

1. The palm may be searched frequently and beetles extracted with beetle hooks and killed.
2. Decaying organic matter, compost heaps, manure pits etc., where the beetle breeds may be sprayed with 0.1% BHC to prevent the pest multiplying there. Spraying may be repeated every three months.
3. The axils of the newly developing leaves may be filled with a mixture of sand and BHC (5%) as a deterrent.

##### 2) *Black headed caterpillar (Nephantis serinopa).*

This pest eats away the leaves leaving the mid-ribs bare. The pest can be controlled in the earlier stages by cutting away the affected leaves or by spraying the affected palms with 0.2% DDT. If the infection is on a large scale, the pest can be controlled biologically by the timely liberation of parasites. The parasites are being bred on a large scale in the parasite breeding laboratories established at Razole (Andhra Pradesh), Kasaragod, Kozhikode, Kayangulam, Vyttila, Kottayam, Quilon and Trivandrum (Kerala State).



3) *Red Palm Weevil*.

The grubs of the pest attack the tender portions of the stem of the coconut just below the crown. The pest can be controlled if detected earlier by injecting Pyrocone E into the affected parts.

4) *Natada nararia*.

This pest has been reported to occur in a severe form in West and East Godavari Districts of Andhra Pradesh. The caterpillars attack the leaves causing holes. It can be controlled by spraying DDT or BHC.

5) *Cockchafer grub*.

In certain parts of Kerala State the grubs have been noted to damage the palm by eating away the roots in the soils. The pest can be controlled by ploughing in 10% BHC dust at 56 lb. per acre, in March-April.

*Diseases.*

The most important diseases affecting the coconut crops are the following:—

1) *Leaf rot*.

This is widely prevalent in Travancore-Cochin area of Kerala State. It is characterised by the rotting of the tips downwards of the central shoot and shrivelling of the distal ends of the leaflets of younger leaves. On drying, the affected portions are broken off into bits by the wind and the leaves assume a characteristic fan shape appearance. Spraying the crowns of the affected palm with 1% Bordeaux mixture or any other copper fungicide three times a year has been found to check the disease. Spraying may be done in March-April, August-September and December-January.

2) *Root disease*.

This is another serious disease prevalent in Travancore-Cochin area of Kerala State. The causative factor of this is still not known but a virus is suspected to be involved. The disease is characterised by the yellowing and drooping of the outer whorl of leaves. In

advanced cases of disease, the leaves and nuts shed in the immature stage, affecting both the yield and quality of nuts. No satisfactory control measures have yet been worked out but there is indication to show that systematic manuring and cultivation of the coconut garden is beneficial.

3) *Anabe roga.*

This disease is prevalent in parts of Mysore State. The symptoms of the disease are similar to those of drought. The infection takes place slowly, the roots become dry and brittle. A brownish sticky fluid exudes from the trunk. The trees succumb gradually to infection in 2 to 3 years. All the infected trees should be uprooted completely and destroyed to prevent its further spread. The application of sulphur to the soil around the trees is reported to give beneficial results.

4) *Stem bleeding.*

This disease characterised by the oozing of a dark red liquid through cracks in the trunk is found in certain tracts particularly where the soils lack proper drainage. The affected parts of the stem should be completely scooped out with chisel and tar applied to the cut surfaces. Drainage of the garden if not in order may have to be improved.

*Bud rot and shoot rot.*

These diseases which are found to occur only sporadically can cause the death of palms, unless the trees are treated in the early stages of attack. All the affected portions may be cut and removed and burnt and the crown sprayed with 1% Bordeaux mixture.

N. B. For more details regarding the various aspects dealt in brief in this note, the local staff of the Agricultural Departments may be contacted.



## ANNEXURE II

### Calendar of operations for the coconut areas in Kerala State.

| Month | Loamy Soils                                                                                                                          | Laterite Soils                                                                                                                           | Sandy Soils                                                                                                    | Alluvial Soils        |
|-------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------|
| (1)   | (2)                                                                                                                                  | (3)                                                                                                                                      | (4)                                                                                                            | (5)                   |
| April | Irrigation wherever it is possible.                                                                                                  | Irrigation wherever it is possible                                                                                                       |                                                                                                                |                       |
| May   | Ploughing after receipt of first rains and growing green manure crop wherever land is tilled <i>in situ</i> wherever it is possible. | Ploughing and sowing green manure crop, wherever land is tilled - Sowing cover crops in undulating and slopy areas.                      |                                                                                                                |                       |
| June  | Planting <i>Gliricidia</i> on hedges opening basins around the trees.                                                                | Planting <i>Gliricidia</i> on hedges opening basins around the trees.                                                                    | Planting <i>Gliricidia</i> on hedges-opening basins around the trees wherever green manuring facilities exist. | Opening basins around |
| July  | Opening basins continued—burying of green manure crop or application of green leaf in basins and covering the basins half with soil. | Opening basins around the trees continued. Burying green manure crop or application of green leaf in basins and covering half with soil. | Application of green leaf in basins wherever green leaf is available and covering basins half with soils.      | do.                   |

| (1)       | (2)                                                                                                                               | (3)                                                                                                                           | (4)                                    | (5)                                                  |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------------------------------|
| August    | Application of top dressing manures.                                                                                              | Application of top dressing manures.                                                                                          | Application of top dressing manures.   | —                                                    |
| September | do.                                                                                                                               | Application of common salt wherever no other manuring is done. Ploughing or digging of soil where no irrigation is practised. | do                                     | Application of top dressing manures.                 |
| October   | Heaping mounds or ploughing according to local practices — burying husks wherever facilities for this exist.                      | Ploughing or digging of soil continued.                                                                                       | Slashing cover crop where it is grown. | Application of top dressing manures.                 |
| November  | Levelling mounds or giving the 2nd ploughing according to local practice. Forming water channels wherever irrigation is possible. | 2nd ploughing or digging and pulverisation of soil where irrigation is not done.                                              | —                                      | Digging or ploughing the soil and pulverising clods. |



| (1)      | (2)                                 | (3)                                                                | (4)                                                                                                                                                                | (5)                  |
|----------|-------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| December | Irrigation wherever it is possible. | Irrigation where such facilities exist — sowing summer vegetables. | Carting and application of clay — wherever clay application is not possible and wherever sand is very coarse application of leaf mulch round the base of the tree. | Application of sand. |
| January  | do.                                 | do.                                                                | Cultivation of Irrigation wherever filter points can be developed.                                                                                                 | —                    |
| February | do.                                 | do.                                                                | do.                                                                                                                                                                | —                    |
| March    | do.                                 | do.                                                                | do.                                                                                                                                                                | —                    |

**Control of pests and diseases.**

**Pests:** Rhinoceros beetle: Treating manure pits with 0.1% solution of B. H. C. once in every 3 months, extraction of beetle and applying a mixture of 10% B. H. C. and sand in equal proportions in the axils of fresh leaves once every month, preferably during harvest time in the case of bearing trees.

*Nephantis serlnopa* (June to January) The pest occurs in coastal and back water areas. Release of parasites in cooler months of incidence and spraying with 0.2% D.D.T. of crown during hot months (February to May).

Red Palm Weevil. Attack occurs generally in young plantations having reached the bearing stage. Injection of 1% Pyrocone just below the crowns.

**Diseases:** Leaf rot and root diseases. Spraying 2 rounds a year — one round in March, April, May and 2nd round between November and February.

(Sd.) For Director of Agriculture.

## ANNEXURE III

### Calendar of operations for Coconut Areas in Mysore State

The calendar of operations for coconut gardens in Mysore State is put up in accordance with the regions in which the crop is found cultivated. The coconut regions in Mysore is broadly divided into three main regions viz., 1. The rain-fed tract, 2. Irrigated and riverine areas and 3. Coastal belt.

The major tract under coconut which is nearly 70% of the total area comes under the rain-fed tract, which are found in the districts of Tumkur, Hassan, Chikkamagalur and portion of Chitaldrug. In this region the coconut gardens are raised in board valleys where water table is fairly high, and the rains are the only sources of moisture for the cultivation of the palms. The soil of this region is sandy loam, slightly gravelly and is well drained.

#### Cultural Operations

During the months of January, February and March fertile jungle earth, at the rate of one to two carts per palm should be carted and heaped in different parts of the gardens. Sheep folding may also be done with good advantage. Just before the pre-monsoon showers all the carted earth, and farm-yard manure at the rate of about 100 lbs. per palm, should be broadcast all over the garden, and ploughed well into the soil. After one or two good showers the whole area should be worked well with a cultivator, and the soil brought to a fine tilth. At this stage when there is sufficient moisture in the soil some green manure seed such as *Crotalaria striata* or sunnhemp or cowpea should be sown all over the garden and the seeds covered by working a suitable implement.

In the month of June-July when there is sufficient moisture in the soil the following fertiliser mixture may be applied to the palms.



1. Super phosphate or Bonemeal - 2 lbs. per palm per year.
  2. Ammonium sulphate - 3 lbs. per palm per year.
  3. Sulphate or Muriate of Potash - 2 lbs. per palm per year.
- Or
1. Groundnut cake - 20 lbs. per palm per year.
  2. Ash - 25 lbs. per palm per year.
  3. Bone meal - 2 lbs. per palm per year.

(If the green manure seeds have already been sown the fertilisers should be applied in basins)

Any one of the above mixtures may either be broadcast all over the garden and well incorporated into the soil or if there is a likelihood of heavy rains, the same mixture may be applied in broad basins dug round each palm and well covered with soil. By about September or October the green manure crop will have made a good growth, and at this stage, it should be ploughed into the soil. By about the end of October the whole garden should be given two or three ploughings and soil should be brought to a fine tilth.

Cuttings or seedlings of *Gliricidia maculata*, should be grown on the borders of each coconut garden, as this will give enough green matter for the application to the palms, in case, the green manure crop fails for want of timely rains. The rate of green leaves to be applied to each palm should be 75 to 100 lbs. per palm.

If these operations are carried out each year the palms will grow vigorously and the yields will increase substantially.

Husk-burial is not practiced in any part of the State although it is being recommended by the Department.

### *Irrigated Zone.*

Coconuts are cultivated as an irrigation crop in parts of Chitaldrug (Vanivilas Sagar areas) and in the districts of Mysore and Bangalore. Here it is generally associated with areca and plantains. In the earlier stages of coconuts, plantain suckers are always planted as a nurse crop.

The soils in these areas are generally sandy loam or red loam.

As the inter-space in between coconut palms in this area is occupied by areca and plantains ploughing cannot easily be taken up. Hence the gardens are generally dug and cultivated. Due to the availability of the irrigation water the cultural operations are easily adjusted to the convenience of the cultivator.

Just before the commencement of the monsoon the whole gardens are dug well and all the weeds removed.

When the whole garden soil is brought to a fine tilth, broad ditches are dug in between the rows and the earth is heaped along the rows of plantains and coconuts. These ditches act as irrigation channels during summer and drains during rainy season.

Cross-wise irrigation channels are also put at convenient intervals.

As it is not possible to grow green manure crops in these gardens due to the presence of Areca and plantains as inter crops *Honge* or *Gliricidia* plants should be grown all along the borders. During May green leaves and cattle manure at the rate of 100 lbs. each should be buried round each palm, and the garden irrigated. During June-July soil round each palm should be stirred well, and the fertiliser mixture previously recommended may be applied round each coconut plant, and covered with earth, and irrigated if sufficient rains are not received. The garden must be free from all weeds before the application of manures and fertilisers. One or two diggings may be given in the months of October or November and the soil brought to a fine tilth. If these operations are continued each year the coconut palms will grow well and the yield of nuts will go up considerably.

### *Coastal Belt*

Coconuts are found cultivated in laterite and sandy soils in the coastal areas of the State such as South and North Kanara Districts. These are generally poor in plant food and every care should be taken to manure the palms to get adequate yields.



### Laterite Soils.

The gardens should be dug or ploughed well in April or May. Green manure crops should either be grown *in situ* or on the borders of the garden.

Farm-yard manure and green leaves should be ploughed in or buried round each palm at the rate of 100 lbs. respectively. As there is a likelihood of getting heavy rains during June-July it is better to apply the fertilisers during the months of August or September. Broad basins should be dug round each palm and the fertiliser mixture of under-mentioned proportions should be prepared and applied in these basins and covered with earth.

- |    |                   |   |        |                    |
|----|-------------------|---|--------|--------------------|
| 1. | Ammonium sulphate | — | 4 lbs. | per palm per year. |
| 2. | Bone meal         | — | 3 lbs. | do.                |
| 3. | Muriate of potash | — | 2 lbs. | do.                |

### Sandy Soils.

These soils are not only poor in plant foods but are also excessively drained and are subject to considerable drought during the rainless season. Adequate soil moisture must be maintained during summer by artificial irrigation. It is better to fertilise the soil by good organic manures rather than by inorganic fertilisers. Any one of the manure mixture recommended by the Indian Central Coconut Committee may be used for manuring the palms. They are as follows:—

- |     |                         |         |               |                            |
|-----|-------------------------|---------|---------------|----------------------------|
| I   | (a) Cattle manure or    |         |               |                            |
|     |                         | Compost | —             | 100 lbs. per palm per year |
|     | (b) Wood ash            | —       | 20 lbs.       | do.                        |
|     |                         | OR      |               |                            |
| II  | (a) Prawn dust          | —       | 15 lbs.       | do.                        |
|     | (b) Muriate of potash   | —       | 2 to 3 lbs.   | do.                        |
|     |                         | OR      |               |                            |
| III | (a) Fish guano          | —       | 15 lbs.       | do.                        |
|     | (b) Muriate of potash   | —       | 2 to 3 lbs.   | do.                        |
|     |                         | OR      |               |                            |
| IV  | (a) Ground nut oil cake | —       | 15 to 20 lbs. | do.                        |
|     | (b) Wood ash            | —       | 20 to 40 lbs. | do.                        |
|     | (c) Superphosphate      | —       | 2 to 3 lbs.   | do.                        |

### Cultivation

The garden land should be ploughed to destroy the weeds and also to prevent the formation of the surface roots. One of the very useful operation in these soils is the formation of a number of small mounds of surface soil and weeds towards the end of South West monsoon and levelling them up in the later stages and working the cultivator.

Green manuring should also be done as described previously.

During the months of March and April, clay or tank silt may be carted and applied to palms at the rate of about 100 lbs per palm. This will greatly improve the moisture retaining power of the soil which is very poor in sandy soils. As a further precaution the soil round each palm should be mulched by dry leaves immediately after the rains. The mulching may be done to an extent of about 8 feet round each palm.

### Pests and Diseases.

#### 1. *Rhinoceros beetle.*

This is a common pest in all the coconut regions of the State. The palms and young seedlings should be searched periodically and beetle removed by means of a hook and killed.

A mixture of 5% B.H.C. and sand if applied to the axils of newly developing leaves the beetle will get repelled.

To prevent the breeding of this pest all manure and rubbish heaps should be sprayed once in three months with 0.1% B. H. C.

#### 2. *Black-headed Caterpillar (Nephantis serinopa).*

This is a serious pest found mostly in the districts of South and North Kanara. In the earlier stages the pest can be controlled by cutting away all the affected leaves and burning them or by spraying the palm with 0.2% D. D. T. It is also controlled biologically by the release of parasites at the proper time.



### 3. *Red Palm Weevil.*

The grubs of this pest attack the tender portions of the stem below the crown. The pest can be controlled if detected earlier by injecting Pyrocone E into the affected parts. This is not a common pest in the interior of the State, but stray cases are reported from the coastal areas.

#### **Diseases.**

Some of the common diseases found in the State are:— 1) *Anabe roga*, 2) Stem bleeding and 3) Bud rot. *Anabe roga.*

This is found in some parts of Mysore such as in the districts of Tumkur and Hassan. Stray cases are also reported from other districts.

To control this disease all the affected palms should be removed with roots and burnt. To prevent the spread of the disease fine sulphur powder should be applied round the palms.

Good cultivation and manuring should also be attended to to improve the vigour of palms.

#### *Stem Bleeding.*

Palms affected by this disease develop thin cracks from which a kind of dark red liquid starts oozing out. Gardens which are neglected and which lack proper drainage have a large number of palms affected by this disease. The disease can be controlled by scooping out the diseased tissue and applying tar or Bordeaux paste to the cut surface. The general conditions of the palms should also be improved by proper cultivation and manuring.

#### *Bud rot and Shoot rot.*

This is found to occur sporadically in all regions of the coconut tract. The palms affected by this disease should be treated in the early stages by cutting off all the affected parts and the crown sprayed with 1% Bordeaux solution. All the diseased parts removed from the palms should be burnt to prevent further spread of the disease.

(Sd.)

Senior Assistant Botanist.

1. The palm may be searched frequently and beetles extracted with beetle hooks and killed.
2. Decaying organic matter, compost heaps, manure pits etc., where the beetle breeds, may be sprayed with 0.1% BHC to prevent the pest multiplying there. Spraying may be repeated every three months.
3. The axils of the newly developing leaves may be filled with a mixture of sand and BHC (5%) as a deterrent.

2. *Black-headed Caterpillar (Nephantis serinopa)*.

This pest eats away the leaves, leaving the mid-ribs bare. The pest can be controlled in the earlier stages by cutting away the affected leaves or by spraying the affected palms with 0.2% DDT. If the infection is on a large scale, the pest can be controlled biologically by the timely liberation of parasites. The parasites are being bred on a large scale in the parasite breeding laboratories established at Nagercoil in Kanyakumari District and Gudiyattam in North Arcot District.

3. *Red Palm weevil*.

The grubs of the pest attack the tender portions of the stem of the coconut just below the crown. The pest can be controlled if detected earlier by injecting a 1% solution of Pyrocone E into the affected parts.

4. *Cockchafer Grub*.

In certain parts of the Kerala State, the grubs have been noted to damage the palm by eating away the roots in the soils. The pest can be controlled by ploughing in 10% BHC dust at 56 lbs. per acre in March-April.

*Diseases.*

The most important diseases affecting the coconut crop are the following:-

1. *Stem bleeding*.

This disease is characterised by the oozing of a dark red liquid through cracks in the trunk and is found in certain tracts, particularly where the soils lack proper drainage. The affected parts of the stem should be completely



scooped out with chisel and tar applied to the cut surfaces. Drainage of the garden if not in order may have to be improved.

2. *Bud rot and shoot rot.*

These diseases which are found to occur only sporadically can cause the death of palms, unless the trees are treated in the early stages of attack. All the affected portions may be cut and removed and burnt and the crown sprayed with 1% Bordeaux Mixture.

3. *Anabe roga.*

This disease is prevalent in parts of Mysore State. The symptoms of the disease are similar to those of drought. The infection takes place slowly, the roots become dry and brittle. A brownish sticky fluid exudes from the trunk. The trees succumb gradually to infection in 2 to 3 years. All the infected trees should be uprooted completely and destroyed to prevent its further spread. The application of sulphur to the soil around the trees is reported to give beneficial results.

N. B. For more details regarding the various aspects dealt in brief in this note the local staff of the Agricultural Department may be contacted.

(Sd) Gazetted Assistant.

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## ANNEXURE V

### Scheme for Intensive Manuring and Cultivation of bearing Coconut Gardens (as applicable to Andhra Pradesh State).

#### *Introduction:*

The present production of coconuts in the Indian Union falls short of the country's requirements by about 25 to 30% and this deficiency is now being made up by imports from other countries. There is, therefore, urgent need to step up internal production in the shortest possible time and achieve self-sufficiency in regard to our requirements of coconut products. The only way to achieve this goal in the near future is to vigorously

tackle the coconut gardens now in bearing as new plantations will take a number of years to reach the normal bearing stage. That improved methods of coconut cultivation will augment production substantially has been demonstrated beyond doubt by the researches done at Central Coconut Research Station, Kasaragod and other Research Stations on the West Coast. It is true that similar information is now not available for the other important coconut regions such as Mysore, Madras, Andhra Pradesh, Bombay and Orissa, but there is no reason to believe that results will be different.

There are a number of improved practices each of which can by itself increase production somewhat; but simultaneous adoption of all the practices will give the maximum results in the shortest possible period. All the available useful information has been summarised below for the guidance of the growers as well as of the extension staff.

The recommendations have been drawn up under two broad headings, viz., manuring, cultivation and other practices and control of pests and diseases. The former have been discussed with the soil type as the main basis as the responses to improved practices have been found to be largely influenced by the physical and chemical properties of the soil. The fact that the rainfall and its distribution and availability of the underground water supplied do make considerable difference in the behaviour of the same soil type is not forgotten and it is conceded that the recommendations are amenable to modifications in the light of the conditions obtaining in a particular area.

### 1. Loamy soil.

#### **Manuring, cultivation and other practices:**

In Andhra Pradesh, coconut in the Uddanam area of Srikakulam and Visakhapatnam Districts is raised on loamy soils. In general the soil is fairly well drained but the fertility status is rather poor. Coconut palms growing in this particular soil type have been found to respond well to manuring and cultivation.



### Manuring.

Any one of the manure mixtures given below may be applied according to availability and price.

| <i>Manures</i>                          | <i>Per tree per year.</i> |
|-----------------------------------------|---------------------------|
| Ammonium Sulphate                       | 3 to 4 lb.                |
| Superphosphate or bone meal             | 2 lb.                     |
| Muriate of potash or potassium sulphate | 2 lb.                     |
| OR                                      |                           |
| Groundnut oil cake                      | 15 to 20 lb.              |
| Ash                                     | 20 to 40 lb.              |
| Superphosphate or bone meal             | 2 lb.                     |

The manures may be applied broadcast and ploughed in if the garden consists of coconut palms only and if the palms are planted not too wide apart. A better method is to apply them in shallow basins dug round the base of the trees. Manuring should be done only when there is sufficient moisture in the soil and this period may vary from tract to tract, depending upon rainfall and its distribution. On the East Coast August-September may be considered as normal manuring period. The manures may be applied in one dose but where rainfall is not quite dependable the dose may be split up into two halves and applied at appropriate times, taking advantage of the favourable conditions.

### Cultivation.

Regular cultivation of coconut gardens is very important in any scheme designed to improve the production. The garden may be ploughed two times in South West monsoon and twice in North East monsoon. The object of cultivation is to remove weeds and create soil mulch. When inter-crops are grown additional inter-cultural operations as may be necessary will have to be given.

### Green Manuring.

Loamy soils are, in general, poor in organic matter and hence this may be augmented by growing a green manure crop *in situ* and ploughing it in, or by bringing

in leaves from outside and applying the same at 50 to 100 lb. per tree per year. Any crop preferably a leguminous one suited to the tract and season may be chosen. For the soils in Uddanam area, *Dhaincha* (*Sesbania auculata*), *Sesbania speciosa* and *Calopogonium mucunoides* may be useful and they may be sown in May-June. Sunnhemp also can be grown. The green manure crops may be incorporated in September-October. Where coconuts are grown in single rows along bunds and borders of other gardens, green leaves may be brought from outside and applied at 50 to 100 lb. per tree. If available cattle manure or compost may be applied instead of green leaves at about 50 lb. per tree. Application of these manures is to be done when there is sufficient moisture in the soil.

Planting of quick growing green manure crops such as *Gliricidia maculata* along the borders of the coconut garden appears to be the most suitable method of producing at site sufficient green leaves for manuring purposes. This crop can be propagated by cutting (preferably rooted) as well as by seedlings. Cuttings may be taken and planted in April-May in specially prepared beds and judiciously irrigated to get them rooted and these may be transplanted in June-July in the field giving a spacing of 5 to 6 feet with the commencement of rains. Seedlings may also be raised in April-May and planted in June-July. In 2 or 3 years' time the plants can be pruned and the prunings applied in basins dug round the base of the trees.

### Husk Burial.

Burying of dry coconut husks in trenches 6 feet wide and 15 inches deep at 1,000 husks per tree in between rows of coconut palms has been found to be a desirable practice in coconut gardens under the conditions existing in the loamy and laterite soils of the West Coast under dry system of cultivation. The benefit of one operation will last for five to six years. Husks are buried in June-July. This practice is not in vogue in the State; there is however a practice now and then of burying some husks along with other organic manures in trenches dug round the trees in the State. Where dry



husks are available readily and cheaply and where soils are of light type as in the Uddanam area and where soils are sandy this practice may be adopted in the State with suitable modifications.

### **Irrigations.**

Where rainfall is insufficient, or where it is sufficient but badly distributed giving rise to long periods of drought, the palm will give better yields if watered during rainless season. It may however be stated that such trees might require irrigation every year and stopping of irrigation in the middle is likely to cause a set back in productivity. In the coastal sandy soils in the Godavary delta and in the Uddanam area of the State irrigation of the plantations will enhance the yields of nuts.

### **II. Laterite and Gravelly Laterite Soils.**

These types of soils are not met with in general in the Andhra Pradesh State and especially under the coconut crop. No recommendations need, therefore, be recorded in this note.

### **III. Sandy Soils.**

Considerable areas under coconut under sandy soils are met with along the East Coast in the State. The soil is excessively drained, poor in plant food and subject to considerable drought during rainless periods. Where soil moisture conditions can be maintained either by artificial irrigation, or through well distributed rainfall, or from high water table, yields can be stepped up by the adoption of improved methods of coconut cultivation. Where drought conditions are of frequent occurrence and maintenance of soil moisture difficult the scope for improving production economically is very limited.

### **Manuring.**

Some of the alternate manure mixtures that may be adopted in manuring trees growing on sandy soils are given below;—

| <i>Manures</i>           | <i>per tree per year</i> |
|--------------------------|--------------------------|
| Cattle manure or compost | 100 lb.                  |
| Wood ash                 | 20 to 40 lbs.            |
| OR                       |                          |
| Fish guano or Prawn dust | 15 lb.                   |
| Muriate of potash        | 2 to 3 lb.               |
| OR                       |                          |
| Groundnut oil cake       | 15 to 20 lb.             |
| Wood ash                 | 20 to 40 lb.             |
| Super phosphate          | 2 to 3 lb.               |

It is better to avoid inorganic forms of fertilisers as not much response has been seen to them in sandy soils. The manures may be applied in basins dug round the base of the trees as mentioned in the case of other soil types. If possible the entire dosage may be given in two separate applications, once in August-September and again November-December depending upon the rainfall distribution.

### Cultivation.

Being poor in fertility weed growth or maintenance of mulch is not a serious problem. However, if weeds do grow cultivation may be done to eradicate them. A more important aspect in sandy soils is to prevent the formation of surface root system because then the trees are found to suffer severely from the effects of drought. In the West Coast, throwing the soil of the garden into mounds towards the end of South West monsoon season and levelling them later has been claimed to be a very beneficial cultural operation in coconut gardens in sandy soils. This practice is not in vogue in the State.

### Green Manuring.

Of all the soil types, this is the one that requires green manuring to be done systematically. However the scope of growing a successful green manure crop *in situ* is limited because of lack of soil fertility. In the loamy soils of Uddanam and coastal sandy soils in the State, *Kolingi*, *Calopogonium* and *Crotalaria striata* may be grown and ploughed in. The two crops last mentioned



are new to this State and their actual utility has to be decided on trials. The quick growing green manure crop of *Gliricidia* may be grown along the borders of the plantation as a source of green leaves. Otherwise, outside sources may have to be tapped for it. Green leaves may be applied at 50 to 100 lb. per tree. Where available cattle manure or compost may be applied at the rate of 50 to 100 lb. per tree per year.

### **Carting of clay.**

Absence of finer clay particles in the soil is responsible for the porous nature and lack of moisture retaining power of the soil. Silt or clay carted from outside and incorporated into the sandy soil will in the long run improve the soil characteristics. This practice is in vogue in the State. In Andhra State silt is brought from irrigation channels and tanks and applied in summer months round about the base of the trunk of the palms.

### **Mulching.**

The effect of drought is severe in sandy soils and in order to mitigate its effects mulching of the soil at least to a radius of 6 feet round the base of the trees may be done with dry leaves or other suitable material immediately after the cessation of the rains. *Calopogonium mucunoides* will form a good cover when it is allowed to continue to grow even in summer months.

### **Irrigation.**

Irrigation of coconut trees growing in sandy soils during summer, or rainless period will greatly improve the productive capacity of the trees. In areas along the sea coast even sea water can be used for this purpose without any ill effects. In sandy soils irrigation facilities can be provided wherever feasible by the installation of filter points.

## **IV. Alluvial soils and re-claimed soils of the backwaters.**

Alluvial soils are generally met with in the deltaic areas of rivers such as Godavari, Krishna, Cauvery, etc. while reclaimed soils are mostly confined to the back-water areas of Travancore and Cochin in the Kerala

State. These soils are generally of average fertility and may not show much of response to fertilization.

### Manuring.

The following manure mixture is recommended:—

|                               |   |            |                   |
|-------------------------------|---|------------|-------------------|
| Ammonium sulphate             | — | 2 to 3 lb. | per tree per year |
| Muriate of potash             | — | 2 to 3 lb. | do.               |
| Superphosphate or<br>Bonemeal | — | 2 lb.      | do.               |

The manures may be applied in basins as referred to previously and under the conditions in the East Coast they may be applied in the the South West monsoon period.

### Cultivation.

Ploughing may be done both in the South West and North East monsoon periods. Two ploughings are given in each of the two seasons. The four ploughings are quite necessary for the heavy soils in the Godavari delta. In cases where ploughing could not be done in time, the soil gets too hard to plough it up and in such cases digging has to be resorted to to keep the soil in tilth and permit aeration in the heavy soils.

### Green Manuring.

The soils in the State are generally not so poor but fertility status has to be maintained and built up. Although green manuring as a routine measure may not be necessary yet it has to be done. Crops like sunnhemp, *Sesbania* and cowpea may be grown *in situ* and ploughed in. Composts and green manure may help also in opening up the stiff soils.

### Carting of sand.

The physical characteristics of stiff clay soils can be improved by the addition of sand in appreciable quantities. In Godavary delta, quite stiff clay soils are not common under the coconut. Addition of canal silt during summer months is done occasionally and this is recommended for adoption.

### Facts to remember.

1. The utility of bulky organic manures such as cattle manure or compost and manures such as ash



will depend upon the care bestowed in their preparation, storage and application. Materials exposed to rain for long periods will have practically no manurial value.

2. It is known that certain kinds of oil-cakes are available cheaply in certain localities. They can be used as a source of nitrogen instead of ammonium sulphate, but have to be applied at 20 to 29 lb. per tree.

3. If it is found difficult to get individual manures and prepare mixtures in the garden itself, the growers may go in for coconut manure mixtures of guaranteed analysis manufactured by well known firms such as Parry and Company.

5. Wherever circumstances permit, the growers can use the inter-space in the coconut plantation to raise short term crops but care should be taken to see that the subsidiary crops are adequately and separately manured. The crops may not also be grown right up to the base of the trees. An area of 6 to 8 feet radius round the base of the trees must be kept vacant so that manuring the coconut palms can be done at the right time. The crops that may be raised differ from tract to tract depending upon local preferences and demand. In the Uddanam tract in Andhra Pradesh red-gram, horse-gram, Ragi (*Eleusine coracana*) tapioca and vegetables such as gourds, brinjal and fruits like pine apple are occasionally grown, while in deltaic area in the State growing intercrops is more common. Dry paddy, vegetables, horsegram, field-bean are common rainfed crops grown; sunnhemp is grown both for fodder and fibre, while banana and turmeric are the common irrigated crops raised under the shade of coconut palms in the deltaic area.

6. Penning of cattle and goats is also in vogue in the State.

### **Control of pests and diseases.**

Pests and diseases affecting bearing coconut palms are responsible for considerable loss of production. Unless they are kept under check the full benefit of other improved methods of coconut cultivation cannot be

realised. Therefore, a short account of the important pests and diseases affecting the coconut in the State is given below together with the control measures.

### Pests.

#### 1. *Black-headed caterpillar.*

This pest eats away the leaves leaving the mid - ribs bare. In Andhra Pradesh, it is found affecting both coconut and palmyra. It is not economical to eradicate the pest on palmyra by spraying insecticides. Therefore, the pest is being controlled in the State by biological means by timely liberation of a set of five parasites, so as to parasitize the egg, larval and pupal stages of the pest. The parasites are being bred on a large scale in the Parasite Breeding laboratories established at Razole and Ambajipet in Andhra Pradesh and Kasaragod, Kozhikode Kayangulam, Vyttila, Kottayam, Quilon and Trivandrum in Kerala State. The parasites are being distributed to the farmers free of cost for release in the affected gardens.

#### 2. *Rhinoceros beetle.*

This is one of the most destructive pests of the coconut palm and it is common in all coconut areas. The adult beetle attacks the crown, boring into developing leaves and flower bunches. The following are the control measures recommended:-

(a) The palm may be searched frequently and beetle extracted with beetle hooks and killed.

(b) Decaying organic matter, compost heaps, manure pits, etc., where the beetle breeds may be sprayed with 0.1% BHC to prevent the pest multiplying there. Spraying may be repeated every three months.

(c) Axils of the newly developing leaves may be filled with a mixture of clay and BHC (5%) as a deterrent.

#### 3. *Slug caterpillar*

The caterpillars of this pest have poisonous hairs and infest coconut trees during summer months. Incidence of the pest is of sporadic nature assuming severity



once in three or four years. In the early stages of infestation, the caterpillars badly scrape off the green matter from the undersurface of leaflets while in later stages they completely eat away the leaves leaving only mid-ribs. Spraying of BHC 0.10% (1½ oz., of BHC 50% wettable powder in one gallon of water), or of DDT 0.16% (1 oz. of DDT 50% wettable powder in one gallon of water) effectively controls the pest.

#### 4. *Rats*

Rats burrow holes in tender nuts and as a result the nuts invariably fall off immediately after attack. Damage by rats is very much high particularly in close planted and neglected gardens. Banding the trees and catching rats by means of traps and other devices are somewhat effective. Poison baiting with zinc phosphide (2%) with cooked or popped rice mixed with attractants like dried fish or onion is advocated. As baiting is extremely poisonous to human beings and animals, baiting should be undertaken with great care.

#### 5. *Red palm weevil*

The grubs of this pest attack the tender portions of the stem of the coconut just below the crown. The pest is not very serious on the coconut in the Andhra Pradesh State where it is seen to attack country Date palms in preference to the coconut. Through the open hole made by the grubs in the trunk of the coconut, Pyrocone E may be injected which consequently kill the grubs.

### Diseases

#### 1. *Bud rot and shoot rot*

These diseases which are found to occur only sporadically cause the death of affected palms, unless the trees are treated in the early stages of attack. All the affected portions may be cut and removed and the crown sprayed with 1% Bordeaux mixture.

#### 2. *Stem bleeding*

This disease is characterised by the oozing of a dark red liquid through cracks in the trunk. It is found particularly in tracts where the soils lack proper drainage.

The affected parts of the stem should be completely scooped out with chisel and tar applied to the cut surfaces. Drainage of the garden, if not in order, may have to be improved.

### 3. *Anabe roga*

The symptoms of the disease are similar to those of drought. The infection takes place slowly, the roots become dry and brittle. A brownish sticky fluid exudes from the trunk. The trees succumb gradually after infection in 2 to 3 years. Excessive moist conditions favour the disease. Drainage has to be improved. All the infected trees with roots, fruits, etc., should be uprooted and burnt. The soil 2 to 3 feet away from the infected tree is to be dug to a depth of 6 to 9 inches and fine sulphur scattered therein evenly at  $\frac{1}{2}$  to 1 lb. per palm; and the soil thrown back; and this treatment is reported to give beneficial results.

### 4. *Decline disease*

This disease is noticed recently in certain places in Razole taluq of East Godavari district. The crown of affected trees gets reduced in size. Leaves become light green or yellow in colour and get reduced in size. Number of spadices produced also gets reduced, nuts become shrivelled and eventually get shed. No new leaves and spadices are formed in the advanced stages. Control measures are not known.

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## ANNEXURE VI

### Calendar of operation for Coconut in Bombay State.

*January.* The crowns of the palms should be cleared of all dying and decaying matter. In addition, spraying with 1% Bordeaux mixture, a copper fungicide should be practiced to prevent infection of disease. If 0.2% D.D.T. is added to the spray it helps in controlling the insect pests etc. This spraying may be repeated in April/May and September/October.



Harvesting of coconuts is to be done as and when the nuts are mature.

*February.* Any grass or shrub left over may be removed and burnt along with the rubbish and trash etc., after giving a hoeing or cultivation to create soil mulch.

In low-lying areas where coconut is planted on bunds clean the canals in between the bunds and strengthen and level up the bunds by adding to their sides and top, soil dug up from the intervening canals.

*March.* At this time, the leaf-eating caterpillar (*Nephantis serinopa*) is active. Affected leaves may be cut away and removed and the palms sprayed with 0.2% DDT or BHC or by releasing the parasites obtained from parasite breeding laboratories at Razole, Kasaragod, Quilon etc., cleaning of the trench, ponds, irrigation canals etc., is done. Watering should be attended to even for older palms.

Pits are dug 25' - 30' apart of size 3' x 3' x 3'. Rubbish trash, dry leaves, etc., is burnt in these pits which prevents white ant attack. These pits are left for weathering action for a couple of months before planting in May end. Where there is heavy rainfall a small bund is raised round the pit to avoid flooding of pit.

*April.* The clearing of tanks, water channals, strengthening of bunds is now completed. If available silt from the trench bed is spread between the coconut palms. Spraying all the palms against fungus disease is carried out with Bordeaux mixture or any copper fungicide. DDT may be added to control the insect pests.

Nursery beds for raising coconuts are prepared and seednuts are collected.

*May.* The land is ploughed 2 or 3 times and all the weeds and grass removed. Sow the seed of the green manure crop such as Sann, Wild Sann, Dhaincha, Sesbania, Kolingi at the seed rate of 25 - 30 lbs. per acre.

In most places where monsoon rains are heavy it is advisable to plant coconut seedlings or fill the gaps by

end of May after a couple of light showers. Vigorous seedlings of selected nuts from Government or approved nurseries may only be planted one in each pit (3' x 3' x 3') spaced 20' - 25' apart. The age of seedlings may vary from 1-3 years. The older ones being used for low-lying places liable to flooding. A foot of loose soil made up of earth, sand and ash (10 lbs.) is filled at the bottom of the pit. Seedlings kept in position and remaining soil filled in and firmed, watering is to be done after planting if there is no heavy rain and support given if there are strong winds.

*June.* This is a very busy month for the coconut garden as the south west monsoon usually sets in the 2nd fortnight of June. The planting of seednuts is done at the spacing of 12" - 15" each way in nursery beds and rejecting seednuts which have dried up and do not contain any water.

Burying of coconut husks in linear trenches 6' broad and 15" deep dug in between rows of palms is advised. The husks are placed in the trenches in 2 layers (concave face up to absorb the water). About 1000 coconut husks are required per coconut tree. This is quite essential if the plantation is raised as a rain-fed crop. This operation is to be done only once in 5-6 years.

Seeds of *Gliricidia* a leguminious crop or its cuttings may be sown or planted all along the borders as hedge plant giving spacing of 4' - 5' between 2 plants. One plant gives 40 lb. leaves after 2 years and its leaves contain 2.9% Nitrogen, 5%  $P_2O_5$  and 2-6% potash. About 300 plants can be grown on the borders of a one acre plot and yields about 6,000 lb. of green leaves every year. These plants can be pruned twice a year.

*July.* The beds in coconut nurseries are carefully weeded and damages done to them set right. Do not manure the seed beds. Select healthy seedlings which have good girth and a large number of leaves and whose leaves split early for transplanting destroying the poor seedlings.

In July, tapioca cuttings are planted on raised beds in coconut gardens. When they put forth 4-5 leaves a



dressing of ash is given and they are earthed up twice after a fortnight's interval. Coconut gardeners are advised to convert the nuts harvested during the rains, which are small in size into ball copra which is more profitable than selling them as such.

*August.* Dig up and turn into the soil the grasses and weeds and green manure crops when breach in rains permits. In August, the branches of nuts are tied with coir rope to the leaf stalks. If not tied the bunches buckle and shed immature nuts. While cleaning the crowns put a mixture of an insecticide having BHC and sand in the holes; pull beetles out with a beetle hook and fill the holes also with this mixture. Spray all dung heaps or rubbish with 0.1% BHC (1 lb. of 50% wettable BHC in 50 gallons of water).

In low-lying areas it is better to plant coconut seedlings in August when the heavy rains are over. Planting is done on sand heaps or mounds of earth 2' - 3' high to avoid water logging. Later, year by year the mounds are connected so that bunds with rows of palms come into being. Use only 2 - 3 year old seedlings for planting in low-lying areas.

*September.* This is the best time for applying manure to the coconut palms on the west coast. It is usual to dig shallow basins round the coconut palms 1½' away from the holes and basins made are 4' - 6' wide and about 9" - 12" deep. The following annual dose of manure may be given in laterite and gravelly soils per tree per year.

|                   |   |                            |
|-------------------|---|----------------------------|
| Ammonium sulphate | — | 4-5 lbs.                   |
| Bonemeal          | — | 3 lbs.                     |
| Muriate of potash | — | 2-3 lbs. per tree per year |

If the soil is sandy give

|                          |   |                               |
|--------------------------|---|-------------------------------|
| Cattle manure or compost | — | 100 lbs.<br>per tree per year |
| Wood ash                 | — | 20-40 lbs.                    |
| Groundnut cake           | — | 15-20 lbs.                    |
| Weed ash                 | — | 20-40 lbs.                    |
| Superphosphate           | — | 2-3 lbs.                      |

50 to 100 lbs. of green leaves of *Gliricidia* or any forest trees may be given per tree in case no green manure crop was grown.

Spraying of the palms for control of fungus disease may be done with Bordeaux mixture and D.D.T. as done in January and April.

*October.* Tying up branches to avoid button shedding, removal of rhinoceros beetle grubs as done in August is resorted to.

The ploughing of the garden if not done in September, should be done now and all grass, weeds etc., removed.

Arrangements should be made to irrigate the palms repeatedly. For this purpose beds and water channels should be made.

*November.* Weeding is done to remove the seeds grass and shrubs. The water channels should also be cleaned.

*December.* If Yam is to be taken as an inter-crop the pits for planting Yam are dug  $2\frac{1}{2}'$  in diameter and 6" deep spaced 4' apart. They are filled with rubbish and burnt.

## ANNEXURE VII

### Calendar of Operations for coconut for West Bengal

#### A. *Manuring, cultivation and other practices.*

The manuring as recommended for loamy soil appears to be suitable. The coconut fertiliser mixture will be prepared under the Coconut Development Scheme on the formula recommended by the Indian Central Coconut Committee for distribution to the intending growers at a subsidized rate.

Green manuring with *Gliricidia maculata* has been widely advocated.

The idea of cultivating coconut gardens at regular intervals is already being propagated.



Husk-burial for manuring is not practiced in this State. However, cultivators will be advised to do so.

**B. Irrigation.**

There is hardly any scope for irrigation of adult coconut trees during dry season as the source of irrigation (i. e. tanks etc.) dry up in dry season. However, cultivators are being persuaded to irrigate where there are irrigation facilities.

**C. Control of pests and diseases.**

*Rhinoceros beetle.* All attempts are being made to control this major pest of coconut as per instructions received (with the help of beetle hooks and application of BHC).

*Leaf rot.* All concerned are being advised to check this menace by application of copper fungicide (viz., perconox) three times a year and adopting clean cultivation.

We have circulated the circular of Indian Central Coconut Committee to all our Extension Staff and Block Development Officers.

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## ANNEXURE VIII

### Calendar of operations for coconut areas in Orissa.

The coconut palm is mainly cultivated in the four coastal districts of Balasore, Cuttack, Ganjam and Puri. The area is estimated at about 11,000 acres of which nearly  $\frac{4}{5}$  is concentrated in the districts of Puri. This district can be divided into three zones namely (1) Coastal sand belt (ii) Loamy soil with high sub-soil water table and (iii) Rocky and mountainous regions. The coconut palm is concentrated in the second region only. There are a few gardens in the first region while there are none in the third. In the Ganjam district, the palm is seen near Chatrapur and Gopalpur. These areas have laterite and gravely laterite soils in small patches and loamy soils tending more towards sandy and at places that are actually sandy. Alluvial soils are found in Cuttack district where towards the sea coast once again the soils

are sandy loam to sand only. In the district of Balasore there are sandy soils and reclaimed backwater areas called as "Char lands". The present calendar of operations for the improvement of coconut cultivation in Orissa is based on this background of coconut cultivation in the State.

1. *Manuring, cultivation and other practices.*

(i) *Loamy soil.* Ammonium sulphate (3 lbs), Superphosphate or bone meal (2 lbs) and Muriate of Potash (2 lbs) may be applied per tree either broad-cast in the entire area or in shallow basins dug round the base of the trees in August-September. During April-May the orchards may be dug up and the soil heaped in mounds and levelled up after the first shower of rains is received. Ploughing may be done once in October-November. Green manuring may be done by applying 100 lbs. per tree per year. *Crotalaria striata*, Sunnhemp, Dhaincha, *Calopogonium mucunoides* *Crotalaria usaramensis* may be cultivated and ploughed *in situ* or brought from other fields for green manuring purposes. A seed rate of 20 to 25 lbs. per acre may be adopted for *Crotalaria striata* and *usaramensis* and 50 to 60 lbs for Sunnhemp, Dhaincha and 8 to 10 lbs for *Calopogonium mucunoides*. Water hyacinth or other compost at the rate of 50 lbs. per tree may also be applied instead of green manure wherever available in August-September. *Gliricidia maculata* and *Sesbania speciosa* may also be grown for green manuring crops. Irrigation may be given once in December-January and once in March-April.

(ii) *Laterite and gravelly laterite soils.* Ammonium sulphate (4 lbs) Bonemeal (3 lbs) and Muriate of Potash (3 lbs) per tree may be applied in shallow basins dug round the base of the tree in August-September. Ploughing may be done twice an year. Green manuring may also be done with Dhaincha or *Crotalaria* species or *Gliricidia maculata* used as border plant. Common salt at the rate of 5 lbs per tree may be applied to ward off white ant attack.

(iii) *Sandy soil.* Cattle manure or compost (100 lbs) and wood ash (20 lbs) may be applied per tree in basins



g round the base of the tree in August-September. In order to avoid the formation of the surface root system which is detrimental to the tree particularly in times of drought, the sandy soil may be heaped up into mounds in January-February and levelled up with the first shower of monsoon rains. Green leaves from other trees may be brought and applied to the trees at the rate of 100 lbs. per tree. Wherever possible *Gliricidia* *aculata* may be grown on the borders of the coconut gardens. Tank silt at the rate of 100 lbs. per tree may also be applied in alternate years in the months of March-May. The sandy soil to a radius of six feet round the base of the trees may be mulched with dry coconut leaves or other leaves or straw etc., from November onwards till the monsoon showers are received. Irrigation greatly helps the yield.

(iv) *Alluvial soils and Reclaimed soils of the Backwaters.*

Ammonium sulphate (2 lbs.), Muriate of Potash (2 lbs.) and Super phosphate or bonemeal (2 lbs.) per tree may be applied in basins around the trees in October-November. Droughting may be done in December-January. Sunnhemp or Dhaincha may be grown for green manuring purpose. Wherever the soil is stiff clay, sand may be carted and applied at the rate of 100 lbs. per tree during the summer months of March to May.

*Control of pests and diseases.*

Pests: (i) *Rhinoceros beetle*. The adult beetle attacks the crowns of the palms by boring into developing leaves and flower bunches. This is a common pest in the coconut areas in the State. The beetle can be controlled by adopting the following control measures.

- (i) The palms may be searched frequently and the beetles extracted with beetle hooks and killed.
- (ii) Decaying organic matter, compost heaps, manure pits etc., where the beetles breed may be sprayed with 0.1% BHC to prevent the pest multiplying there. Spraying may be repeated every three months.

- (iii) The axils of the newly developing leaves may be filled with a mixture of sand and BHC (5%) as a deterrent.

(ii) *Black-headed caterpillar* (*Nephantis serinopa*). This pest eats away the leaves leaving the mid-ribs bare. The pest can be controlled in the earlier stages by cutting away the affected leaves or by spraying the affected palms with 0.2% DDT. In the case of large-scale infections the pest can be controlled biologically by the timely liberation of parasites. This pest is prevalent in Puri district.

(iii) *Red Palm Weevil*. The grubs of the pest attack the tender portions of the stem of the coconut just below the crown. The pest can be controlled by injecting Pyrocone E into the affected parts if detected earlier.

#### *Diseases:*

(i) *Stem Bleeding*. This disease characterised by the oozing of a dark red liquid through cracks in the trunk is found in certain tracts particularly in the district of Puri where the soils lack proper drainage. The affected parts of the stem should be completely scooped out with chisel and tar applied to the cut surfaces. Drainage of the garden is to be improved.

(ii) *Bud-rot and Shoot-rot*. These diseases which are found occurring only sporadically cause the death of palms, unless the trees are treated in the early stages of attack. All the affected portions may be cut and removed and burnt and the crown sprayed with 1% Bordeaux mixture.

The calendar of operations for coconut areas in Orissa which have been given above may be carried on in different months according to the following schedule.

1. *January*: All weeds in coconut gardens may be up-rooted and turned in during this month. Newly planted seedlings are to be watered twice a week. Old palms in lateritic and sandy soils may be watered once a week in shallow basins of about 6 feet radius dug round the tree during this month. Wherever the palms are planted on bunds the work of strengthening the sides of



bunds may be taken up. The silt and earth from the canals may be removed and utilised for the purpose wherever possible. Seed coconuts may be collected from the selected mother palms during the month. Palms affected with leaf-eating caterpillar are to be sprayed with 0.2% D.D.T., after cleaning the crowns. All the old spathes, stipules and other matter which comes off easily when pulled by hand may be removed.

2. *February.* The summer drought usually sets in during this month. Efforts should be made to conserve the moisture present in the soil and make it available to the coconut palms. Stray shrubs and weeds particularly grass that have come up must be removed and a proper soil mulch created. The dry grass and other rubbish may be gathered from the fields and burnt in odd places away from the palms. The incidence of the black-headed caterpillar pest generally assumes severe proportions during this month and the next. These caterpillars eat the green under surface of the leaf-lets, resulting in a severe set back of the yield and vigour of the palms. The affected and adjoining old palms may be sprayed with 0.2% DDT two times with an interval of 15 days. In areas where spraying has not been done, the parasites of this pest may be released to control it. The water channels in certain low-lying and back-water areas may dry up during the month. These may be cleaned and the earth from these channels utilised for strengthening the bunds on which coconuts are grown. The drainage channels may also be similarly cleaned. Subsidiary crops like yams may be planted in young coconut gardens which have not yet started bearing during this month. These crops should be manured and cultivated properly as otherwise the main coconut crop will be affected.

3. *March.* The month of March is the most suitable part of the year for cleaning up the channels and tanks and recovering and replacing of valuable lost soil on bunds. Watering the seedlings is to be done at least twice a week. In severe areas of drought even the adult palms are to be watered this way. Wherever there are assured and good sources of water supply and it is possible to profusely water the young seedlings regularly,

the coconut seedlings may be planted in the beginning of this month so that they would establish themselves well by May end, after which the monsoon would bring them up better. Where white ant attack is observed, the top half foot layer of the soil at the base of the seedling should be treated with 0.1% BHC solution; later for the duration of the summer add BHC once in 15 days. The palms may also be sprayed against *Nephantis* attack to control it during this month. Parasites may also be released during this month. Penning of sheep and cattle in the coconut gardens may be done during the month. Interculture and manuring operations and watering for the summer vegetables usually sown in January may be done in this month.

4. *April*. The operation of cleaning and deepening of tanks, ponds and channels and earthing up and strengthening their sides which commences in March, is continued during this month. The silt can advantageously be spread in coconut gardens and incorporated into the surface soil either by ploughing or digging or in basins round the coconut palms. Preparatory work for the planting of monsoon vegetables will be done during the month. Nursery beds for sowing seed coconuts are prepared during the month.

5. *May*. The seed coconuts are sown in the nursery in this month. New planting (pre-monsoon planting) and under plantings of seedlings are done in this month also in order to shorten the period of watering in places of water scarcity. Only the very best seedlings should be planted. Sowing of the seeds of green manure crops with the pre-monsoon showers, after ploughing the garden once or twice is to be done. The method of sowing seeds, seed-rate etc., are given below:-



| Green Manure                                  | When to sow                                      | Seed rate                                                                                               | How to sow                                               | Quantity of green manure obtained                                                                              | When to incorporate in the soil. |
|-----------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------|
| 1. Sunnhemp                                   | April-May with the receipt of the first showers. | 30-40 lbs. per acre.                                                                                    | Broadcast & cover with a light plough jr. hoe or harrow. | 5000 to 7000 lbs. per acre.                                                                                    | August-September.                |
| 2. <i>Crotalaria striata</i> (Wild sunn hemp) | do.                                              | 20-25 lbs. per acre.<br>The seeds before sowing may be pounded with fine sand.                          | do.                                                      | 10,000 lbs. per acre.                                                                                          | do.                              |
| 3. Cow-gram                                   | June-July                                        | 50-60 lbs. per acre.                                                                                    | Dibbled in shallow plough furrows.                       | 8,000 lbs. per acre.                                                                                           | do.                              |
| 4. <i>Calopogonium mucunoides</i>             | May-June                                         | 8 to 10 lbs. per acre.                                                                                  | Broadcast                                                | 8,000 to 10,000 lbs. per acre.                                                                                 | do.                              |
| 5. <i>Gliricidia</i>                          | April-May                                        | Cuttings planted in beds later transplant-<br>ed at 5 to 6 feet apart along the boundary of the garden. | Trans-planting.                                          | 10 to 15 lbs. of green leaf per plant within a year or two. Two or three loppings may be done in older plants. | do.                              |

Carting clay or sand depending on the soil condition regular irrigation and sowing of inter - crops such as maize, ginger, colacasia etc., are done.

6. *June.* The south-west monsoon sets in normally by about the end of May or the beginning of June. It is a busy month for the cultivator as he has to attend to innumerable things such as preparing basins round coconut palms, putting manures in them, planting coconut seedlings in pits, sowing seednuts in the nurseries. The basins round the palms should be 4 feet wide, 1 foot deep and at least a foot and a half away from the boles. At the beginning of the south-west monsoon, green leaves and cattle manure are put into the basins. The green leaves at the rate of 50 to 100 lb. per tree are spread first and the cattle manure at the rate of 100 lb. per tree applied over them. The manures are then covered with a layer of earth scraped from around the bole of the palm. The old roots on the bole are also cut and removed in the process. During the rains the green leaves and the dung rot in the basin. Towards the end of the monsoon manures such as bonemeal etc., are applied and the basins completely covered. Normally the coconut seedlings are planted at the permanent places in this month. In elevated regions the seedlings should be planted in pits of 3 feet cube and in low-lying areas they should be planted on bunds. At very low levels, they should be planted on heaps made up of 30 to 35 cubic feet of earth particularly sand. In sandy areas some dry husks with the fibrous face up may be arranged to be placed round the seedlings and covered up. These help in retaining water to draw in summer by the seedlings. Monsoon vegetables will be manured this month.

7. *July.* Weeds begin to grow round coconut seedlings planted earlier with the onset of the rains. Their removal should be attended to during this and other months. The nursery should be attended to. Germination of the seednuts may be carefully recorded and quality seedlings selected by recording the good girth more number and early splitting of leaves and height. "Ball copra" may be prepared out of the nuts harvested



during this month and the other rainy months as the usual "sun dried" copra cannot be made on account of rains. The incidence of Rhinoceros beetle will be at its maximum during the heavy rains. Control measures should be adopted to check this beetle. Vegetable crops grown need manuring a second time. *Gliricidia* cuttings grown in nurseries are to be transplanted in this month.

8. *August*. All kinds of grasses and weeds grown may be dug up and turned under the soil. The crowns of the palms may also be cleaned and wherever required the tender coconut bunches particularly of this month, September and October which mature for harvest in January, February and March are to be tied up as otherwise they may buckle and shed nuts in the immature stage on account of their heaviness. Preparations for sowing winter vegetables may be made. In low-lying areas this month and the next are good for planting coconut seedlings while in very low-lying ones October - November are the best. Control measures against the Rhinoceros beetle attack may also be undertaken in this month.

9. *September*. This is the best month for the application of manures and ploughing and cultivation of the palms. During the rains the water fills the basins and the bulky manures decompose and mix with the soil. In this month concentrated manures are added to the basins and the basins completely filled with the earth. The first ploughing of the garden after the rains may be done in this month.

10. *October*. The ploughing of coconut gardens if not already taken up, should be taken up this month and finished. Digging the soil and piling up mounds in low-lying areas is to be carried out. The heavy bunches that come to harvest during the summer months are in the tender nut stage now. To avoid buckling and shedding of immature nuts these bunches are to be tied with the petioles of upper leaves. Land for the transplantation of winter vegetables may be prepared.

11. *November*. Cultural operations like ploughing or digging which help retention of soil moisture during summer may be undertaken in low-lying areas. Weeds

and grass clumps may be removed and burnt. Seedling pits should be weeded. Winter vegetables are to be transplanted.

12. *December.* The soil mounds piled up earlier are scattered and levelled. In the coconut gardens where facilities for irrigation exist, basins round the palms and leading channels are prepared during this month so that watering can be commenced from the month of January. Pits for planting yams as an inter - crop are dug up during this month.

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## APPENDIX XXVII

### Secretary's Note

*Subject No. 40.* Proceedings of the meeting of the Special Sub-Committee for drawing up scheme for conducting Mother Palms and yield Competitions.

The Indian Central Coconut Committee at its last meeting held in January 1959, while considering the scheme submitted by the Kerala Government for conducting coconut crop competitions, had decided that competitions should be organised on the basis of high yielding mother palms in individual holdings (vide subject No. 44 of the proceedings of the last meeting).

As the Indian Central Arecanut Committee had already constituted a Special Sub-Committee for drawing up a scheme for the selection of arecanut mother palms, that Sub-Committee was requested to draw up a suitable scheme for the selection of coconut mother palms and organising coconut mother palm and yield competitions.

The Sub-Committee met in May 1959 to frame rules for conducting arecanut and coconut mother palm and yield competitions. A copy of the proceedings of the meeting is attached to this note. The rules for conducting coconut mother palm and yield competitions may be seen on pages 11 to 14 of the proceedings.



The Sub-Committee has suggested holding the mother palm and yield competitions in the Development Blocks each block being treated as a unit for the award of prize. Where there are no Blocks the taluk will be the unit. The units will be grouped into a certain number of regions and prizes will be awarded at the unit and region level. The unit prize will be Rs. 125 in kind and a certificate of merit and the Regional prize Rs. 250 in cash and a certificate of distinction.

The Sub-Committee is of the view that the success of the competition for which the rules have been framed depends entirely on the correct and faithful enumeration of individual trees for yields at regular intervals which in turn involves a good deal of additional labour for the Agricultural Assistant or the Agricultural Extension Officer concerned. They have, therefore, recommended that these officers be given a duty allowance or an honorarium of Rs. 5 per plot entered for the competition.

The Committee may now decide whether they approve of the rules for the selection of coconut mother palms and yield competitions framed by the Special Sub-Committee and the payment to the Agricultural Assistant and Agricultural Extension Officers concerned of an honorarium of Rs. 5 per plot entered for the competition.

The Subject may first be considered by the Agricultural Research and Development Sub-Committee (Development and Extension Wing).

**Proceedings of the Meeting of the Special Sub-Committee, constituted by the Indian Central Arecanut Committee for drawing up a Scheme for selection of Mother palms (Mother palm and yield competition for both Arecanut and Coconut).**

The Sub-Committee first met at the office of the Indian Central Arecanut Committee, Kozhikode on 11-5-1959 and then at the office of the Indian Central Coconut Committee, Ernakulam on 28-5-1959. The

meeting held at Kozhikode was attended by the following members and visitors.

1. Shri C. M. John (Chairman).
2. Shri C. T. Ittiachan.
3. Shri K. Sivasankara Menon, D. A., Kerala.
4. Dr. K. P. V. Menon, Director, C.C.R.S. Kayangulam.
5. Shri Ghouse Mohiyuddin, Arecanut Specialist I/C.
6. Shri B. S. Varadarajan (Convener).

*Visitors.*

1. Shri V. S. Govindarajan, Arecanut Technologist.
2. Shri N. S. Vaidyanathan A. D. O. Kerala.
3. Shri S. Sooryanarayana Pillay, Stat. Officer.
4. Shri K. G. Biddappa, Agricultural Officer.

*Subject No. 1.* Election of Chairman for the Sub-Committee.

The Sub-Committee unanimously elected Shri C. M. John as the Chairman.

*Subject No. 2.* Drawing up a scheme for selection of mother palms in respect of Arecanut and organisation of crop competition in Arecanut.

At the outset the Chairman said that at the last Annual meeting of the committee, a scheme for conducting crop competition in arecanut was considered and the Committee felt that the whole procedure of awarding prizes might be changed to include mother palms also for awarding prizes. Now this Sub-Committee is to chalk out plans for implementing this scheme. He also stated that from the Secretariat note it was found that the Government of Kerala have made certain observations on selection of plots for arecanut crop competition. He wanted to know whether there were any fresh suggestions from the State Governments on this matter.

Shri Sivasankara Menon said that there were crop competitions on coconut before the State re-organization and there were complaints to the effect that the



competitions were not conducted in a very satisfactory manner and the distribution of prizes was also not done as desired. He suggested therefore that there was need for carefully planning to conduct the competition in a proper manner.

Shri C. T. Ittiachan stated that the N. E. S. Blocks had been demarcated in all the States and that there would be some staff in every Block for agricultural work. They could be entrusted with the work of conducting crop competitions.

The Chairman said that the idea behind the scheme was to make the arecanut growers more interested in arecanut cultivation and so he suggested that there should be two prize schemes, one for well maintained gardens giving high yields and the other for the best garden which produced maximum number of good mother palms as the man who maintained a good garden might not have the good mother palms according to the standards fixed by the Committee. He also suggested that the competition might be extended to all the Arecanut growing States in the country. The Sub-committee agreed with the above suggestions of the Chairman and decided to modify the rules for conducting Arecanut Yield Competition in Kerala and Mysore States as "Rules for Conducting Arecanut Mother Palms and Yield competitions".

The Secretary pointed out that there existed wide difference in yield due to differences in age of the palms, quality of nut and stage of harvest and even within a State itself there was wide variation from region to region. So he suggested that the Sub-committee might consider competition at the unit or Block level and another at the State level for sun-dried and processed nuts on a separate basis. The Sub-committee decided to give prizes on yield competition at State level for harvests for ripe or tender nuts.

The Sub-committee thereafter scrutinised the rules provisionally drafted clause by clause and revised rules were drafted for conducting Arecanut Mother Palms and Yield competition. As regards the standards to be fixed

for selection of mother palms the Sub - committee decided that the same would have to be further scrutinised by the Arecanut Specialist and Secretary of the Indian Central Arecanut Committee based on information available with them and it was further decided to request the Secretary to circulate to the members of the Sub - committee the revised rules as amended by the Sub - committee well in advance of the next meeting for their further scrutiny.

*Subject No. 3.* Drawing up a Scheme for selection of mother palms in respect of coconut and organisation of crop competition of coconut.

*Subject No. 4.* Consideration and approval of the proforma for maintaining register of mother palms for arecanut.

The Sub - committee considered the letter received from the Secretary of the Indian Central Coconut Committee and felt that since the existing rules for organising coconut crop competitions were not available with the sub - committee, it should meet again for drawing up a scheme for selection of mother palms and organisation of crop competition. Dr. K. P. V. Menon, Director, Central Coconut Research Station, Kayamkulam presented the rules that were available with him but the Sub - committee felt that as they required close scrutiny the Secretary, Indian Central Coconut Committee might be requested to circulate the necessary information to the members of the Sub - committee well in advance of the next meeting.

The Chairman suggested that the next meeting of the Sub - committee might be convened at the Office of Indian Central Coconut Committee at Ernakulam on 28th May, 1959 to finalise the rules and scrutinise the draft proforma for the maintenance of a national register of mother palms at the head office of the Indian Central Arecanut Committee.

At the Meeting held at Ernakulam on 28-5-1959 at 3 p. m. the following were present:-



1. Shri C. M. John (*Chairman*)
2. Shri C. T. Ittiachan.
3. Dr. K. P. V. Menon, Director, C. C. R. S.,  
Kayamkulam.
4. Shri Ghouse Mohiyuddin, Arecanut  
Specialist I/C.
5. Shri B. S. Varadarajan (*Convener*)

*Visitors.*

1. Dr. P. J. Gregory, Secretary, Indian Central Coconut Committee.
2. Dr. K. M. Pandalai, Jt. Director, CCRS Kasargod.
3. Shri T. Gopalan Nair, Joint Director of Agriculture (Research) Kerala.
4. Shri P. M. Kochappa Menon, Dy. Director of Agriculture (Coconut Development)

The Sub-committee considered the revised draft rules for conducting Arecanut mother palm and yield competition and finalised the same. The rules as finalised are found in Annexure I. The Sub-committee, while considering these rules, suggested that the Secretary, I. C. A. C. might furnish suitable proforma for application form, harvest register and yield statement to the concerned Directors of Agriculture.

The draft rules for conducting coconut crop and yield competitions supplied by the Secretary, I. C. C. C. were then scrutinised clause by clause. The final amended rules are found in Annexure II.

\*\* The Sub-Committee was of the view that the success of the competition for which the rules have been framed for both Arecanut and Coconut depended entirely on the correct and faithful enumeration of individual trees for yields at regular intervals which in turn involved a good deal of over time and additional work on the

\*\* The Sub-Committee also approved the proforma prepared by the Secretary, I. C. A. C. for maintaining a national register of mother palms for Arecanut at the head office of the I. C. A. C.

part of the Agricultural Assistant or Agricultural Extension Officer for the area concerned. The Sub-Committee, therefore strongly recommended that they be given a duty allowance or an honorarium of Rs. 5 per plot entered for the competition for each of these crops.

With a vote of thanks to the chair the meeting terminated at 6 p. m.

C. M. JOHN (Sd.)  
Chairman.

## ANNEXURE I

### Rules for conducting Arecanut mother palm and yield competitions.

1. This competition is organised by the Indian Central Arecanut Committee and the Governments of the States concerned with a view to promote better cultivation and production of arecanut by assessing the quality of palms and yield of arecanuts grown under any system of cultivation.

2. These rules shall be known as Arecanut mother palm and yield competition rules.

3. The competition is open at the block level and taluk level for non-block areas and State level to all bonafide arecanut cultivators.

4. The plot adjudged to have the maximum number of high-yielding mother palms and / or has yielded the maximum number of nuts (whether tender or ripe) during 12 months from 1st July of the year to 30th June will be awarded the prizes mentioned hereinafter.

5. Plots which are entered for the competition shall be a compact block of not less than 1/10th of an acre in extent and having a minimum of 40 palms of bearing age in a contiguous area. Competitors can have not more than two plots entered for competition by paying the additional entrance fee.



6. No competition shall be held in a unit unless there are at least 10 cultivators entering plots for the competition.

7. Cultivators who wish to participate in the competition shall send in their application in duplicate in the prescribed form to the Project Officer or Block Development Officer in the Block areas and the Agricultural Assistant in non-Block areas as the case may be on or before the date announced for the purpose. Forms of application will be made available at the office of the above officers.

8. One copy of the application will be returned to the applicant if his entry is accepted and shall be assigned a serial number and shall be provided with a card of entry showing the name of the competitor and details of the land included in the competition.

9. The application shall be accompanied by an entrance fee of Rupee one for every plot entered for the competition. The competitor will be given a receipt by the Officer for the entrance fee taken.

10. Every competitor shall maintain a correct and detailed account of the cultivation practices carried out in his garden which should be shown to the Agricultural Officers and Judges appointed for the competition.

11. The competitor shall number all the arecanut palms in the plot entered for competition and the numbers shall be written prominently on the trees in tar. Nuts from these trees should be harvested at the stage of maturity depending upon the practice of the locality concerned i. e. either as ripe or as tender and recorded tree-wise. The yield (in terms of number of nuts) of the entire plot will be struck for the year to judge the annual yield of the plot.

12. When the nuts are ready for harvest, the competitor shall give notice to the Agricultural Extension Officer or Agricultural Assistant of the date proposed for harvest each time at least a week before that date.

13. For judging the crops in the unit, Block Development Officer or the Project Officer or the Agricultural Assistant of the unit shall arrange to have a

committee of judges constituted, consisting of the Block Development Officer or D. A. O. as the President, the Agricultural Extension Officer or Agricultural Assistant as Secretary and three non-officials nominated by the D. A. O. or B. D. O. or the Project Officer.

14. The harvesting shall be done in the presence of one or more judges and the competitors or their duly authorised agents. Such of the other competitors of the area as may be willing may also be present.

15. The nuts harvested every time from each plot entered for competition shall be recorded tree-wise by the Agricultural Extension Officer or the Agricultural Asst. and a statement showing the yield of the plot prepared in quadruplicate duly attested by the judges and the competitor or his authorised agent present on the spot. One copy of the statement shall be given to the competitor, the second given to the Committee of judges, the third to the Director of Agriculture of the concerned State and the fourth sent to the Secretary, I. C. A. C.

16. At the close of the year, the Agricultural Extension Officer or Agricultural Asst. shall prepare also in quadruplicate a statement of the yield of nuts per acre per annum in respect of each of the plots entered for competition and send one copy of it to the competitor, the second to the committee of judges, the third to the Director of Agriculture of the concerned State and the fourth to the Secretary, I. C. A. C.

17. The competitor in a unit whose plot produced the highest yield by number of arecanuts per acre per annum shall be given a prize of Rs. 125 in kind and a certificate signed by the Director of Agriculture of the State concerned.

18. The competitor in the State whose plot produced the highest yield by number of arecanut per annum will be given a cash prize of Rs. 250 and a certificate signed by the President, I. C. A. C.

19. The competitor in a unit whose plot has the maximum number of high yielding mother palms (percentage) shall be given a prize of Rs. 125 in kind and



ificate signed by the Director of Agriculture of the  
e concerned.

20. The competitor in the State whose plot has the  
imum number (percentage) of high yielding mother  
s shall be given a cash prize of Rs. 250 and a certifi-  
signed by the President, I. C. A. C.

21. In the case of a tie the concerned prize will be  
led equally.

22. In judging mother palms the following criteria  
ld be followed:-

i) The palms that are middle aged and above alone  
will be considered suitable and they should be  
healthy in appearance and free from all disease  
and pests. They should also possess the follow-  
ing minimum specifications noted against each  
region.

a) Kerala excluding Kasaragod Taluk:-

|                             |                |
|-----------------------------|----------------|
| i) Number of open leaves    | 7              |
| ii) Number of bunches       | 3              |
| iii) Type of nut            | Big and medium |
| iv) Number of nuts per tree | 300            |

b) South Kanara including Kasaragod Taluk and N.  
Kanara and Sagar.

|                             |                |
|-----------------------------|----------------|
| i) Number of open leaves    | 9              |
| ii) Number of bunches       | 4              |
| iii) Type of nut            | Big and medium |
| iv) Number of nuts per tree | 600            |

c) Malnad, Mysore (Shimoga excluding Sagar, Chick-  
magalur and Hassan)

|                             |       |
|-----------------------------|-------|
| i) Number of open leaves    | 8     |
| ii) Number of bunches       | 3     |
| iii) Type of nuts           | Small |
| iv) Number of nuts per tree | 900   |

d) Maidan (Tumkur, Mysore and Chittaldurg) in-  
cluding Coorg.

|                             |        |
|-----------------------------|--------|
| i) Number of open leaves    | 8      |
| ii) Number of bunches       | 3      |
| iii) Type of nut            | Medium |
| iv) Number of nuts per tree | 700    |

e) Bombay State (Colaba, Ratnagiri and Sawantha-wadi)

|      |                         |        |
|------|-------------------------|--------|
| i)   | Number of open leaves   | 8      |
| ii)  | Number of bunches       | 3      |
| iii) | Type of nut             | Medium |
| iv)  | Number of nuts per tree | 450    |

f) Assam and West Bengal.

|      |                         |        |
|------|-------------------------|--------|
| i)   | Number of open leaves   | 8      |
| ii)  | Number of bunches       | 3      |
| iii) | Type of nut             | Medium |
| iv)  | Number of nuts per tree | 450    |

ii) The mother palms are first marked based on the first three morphological characters sufficiently ahead of the commencement of harvesting season. These palms are then finally selected after counting the total number of nuts at the close of the harvest season.

iii) The performance of the selected mother palms will be observed for two years for their consistency in bearing and the prize awarded at the close of two years.

iv) The mother palms entered for competition will be checked up by the Arecanut Development Officer of the State concerned and / or by the Officer-in-Charge of the R. A. R. S. or their Assistants.

23. The prizes will be awarded at public meetings organised at the Block or Taluk headquarters for award of unit prizes and at State headquarters for the award of State prizes.

24. All competitors shall abide by the above rules and any competitor who at any stage fails to observe the rules shall be disqualified to take part in the competition and his entrance fee forfeited.

25. Objections by the competitors against the decisions of the judges shall be lodged within a week after harvesting, with the Block Development Officer or Project Officer or District Agricultural Officer and the



decision of the Director of Agriculture of the concerned States shall be final in all matters connected with this competition.

26. The Directors of Agriculture of the concerned States shall have the right to pass subsidiary rules for the proper conduct of this competition in consultation with the I. C. A. C. and to make suitable modifications in the *modus operandi* and all competitors shall agree to abide by the modified rules and procedure.

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## ANNEXURE II

### Rules for conducting coconut mother palm and yield competitions

1. This competition is organised by the Indian Central Coconut Committee and the State Governments concerned to promote better methods in coconut cultivation and better production. The expenditure and receipts of the competition shall be shared by the State Government concerned and the Indian Central Coconut Committee on 50 : 50 basis.

2. These rules shall be known as "The Coconut Mother palm and yield Competition Rules".

3. The competition is confined to all Community Development Blocks (National Extension Service, Post Project Blocks, Post Intensive Blocks, etc.) and is open to all *bona fide* coconut cultivators in these Block areas. In non-block areas, the competition at taluk level may also be brought under this competition at the discretion of the Director of Agriculture of the State concerned.

4. There will be unit prizes treating each Block or Taluk as a unit and regional prizes at State level depending on the number of regions fixed by the Director of Agriculture of the State concerned.

5. The size of the plot registered for competition shall be one acre of regular coconut plantation of even spacing without inter-crops or inter-plantation.

6. There shall be a minimum of 6 competitors in a block to qualify it to enter into the competition.

7. The competition shall be held between 1st July and 30th June every year.

8. Cultivators who wish to participate in the competition shall send in their applications in duplicate in the prescribed form to the Block Development Officer or Agricultural Assistant concerned. The forms necessary for the purpose shall be made available at all Block offices. Suitable proforma for application forms, harvest registers etc., will be furnished to the Directors of Agriculture concerned by the Secretary, Indian Central Coconut Committee.

9. Each application will be accompanied by an entrance fee of Re. 1 for every plot entered for the competition. (A competitor can have not more than 2 plots for the competition).

10. On acceptance of the entry, one copy of the application shall be returned to the applicant and he shall be assigned a serial number and shall be provided with an entry card showing the name of the competitor and particulars of the plot or plots included in the competition.

11. The competitor shall number serially all the coconut trees in the competition plot in tar. Only the mature nuts shall be harvested and the total annual yield of nuts obtained from the plot between 1st July and 30th June shall be considered for judging the results.

12. The yield records shall be maintained in the prescribed form tree-wise, by the Agricultural Extension Officer of the Block or the Agricultural Assistant of the Taluk who shall attend each harvest in the competition plots. The harvest entries, after each harvest, must be attested by the Agricultural Extension Officer or Agricultural Assistant, the competitor and by a reliable witness in the neighbourhood.

13. Ten days before the date of every harvest, the competitor shall inform, in writing, the concerned Agricultural Extension Officer or Agricultural Assistant the date proposed for harvest.



14. The Block Development Officer or the Agricultural Assistant shall prepare a statement of yield in quadruplicate within a month of every harvest, shall file a copy in his office and shall forward a copy each to the competitor concerned, the District Agricultural Officer and to the Secretary, Indian Central Coconut Committee.

15. A similar statement shall be prepared and forwarded by the Block Development Officer or the Agricultural Assistant to persons cited in rule 14 at the close of the competition year showing the total annual yield obtained from the competition plots in the Block.

16. The competitor in a unit whose plot produces the highest number of mature coconuts harvested per acre per annum shall be given a prize of Rs. 125 in kind and a certificate of merit signed by the Director of Agriculture of the State concerned.

17. The competitor in the region producing the highest annual yield per acre shall be given a regional prize of Rs. 250 and a certificate of distinction signed by the President, Indian Central Coconut Committee.

18. In case of a tie the concerned prize shall be divided equally.

19. The Director of Agriculture of the concerned State shall have the right to pass subsidiary rules for the proper conduct of the competition in consultation with the Indian Central Coconut Committee and all competitors shall abide by the modified rules and procedure.

20. The Secretary, Indian Central Coconut Committee shall furnish the proforma for the forms of application, harvest register and yield statements.

21. The following rules will apply to the award of prizes for mother palms:—

- (a) The competitor whose plot has the largest number of high-yielding mother palms (percentage) in his plot will be awarded a prize of Rs. 125 in kind at Block or taluk level and Rs. 250 in cash at the regional level.

- (b) In judging mother palms, the criteria prescribed for the selection of mother palms in "The Coconut Nursery Officers' Manual" should be followed, namely, (i) trees which have passed the middle age and with an yield of over 80 nuts per year will only be considered as good mother palms; (ii) the crown of the mother palm should be spherical and the leaves should have short and thick petioles and wide leaf base; (iii) at any time there should be, on the crown a minimum of 12 bunches with large number of nuts at different stages of development. The bunch stalks should be short, stout and strong and should not show any tendency to buckle or droop down; (iv) the nuts should be of medium size and round or oblong in shape with high copra content.
- (c) The mother palms should be checked by the Coconut Development Officer of the State or any other responsible officer deputed for the purpose by the Director of Agriculture concerned.
- (d) The first award of mother palm prize will be made in the second year.

22. These rules replace all other rules, if any, passed previously regarding the conduct of coconut crop competitions.

## APPENDIX XVIII

### Secretary's Note

#### EXTENSION SCHEME

*Subject No. 44.* Proposal for the extension of the Coconut Nursery Scheme, Wadakkancherry, Kerala State.

1. Name of the scheme: Coconut Nursery Scheme, Wadakkancherry.



2. Location: Wadakkancherry, Kerala State.
3. Object of the scheme: To distribute 4,200 quality seedlings annually.
4. Date of commencement of the scheme: 11th July, 1955.
5. Date of termination of the present scheme: 10th July, 1960.
6. Results achieved (in brief) A total number of 8,571 seedlings are reported to have been distributed during the years 1955-56 to 1958-59 as against the target of 12,000 seedlings.
7. Reasons for extension: The nursery caters to the needs of the growers in the Talapilly and neighbouring taluks. It is reported that as a result of the propaganda carried out by the departmental staff the cultivators have recognised the advantages of planting quality seedlings and the demand for seedlings produced in this nursery is steadily increasing. Besides, there is also some scope for expansion of coconut cultivation in the Talapilly and Chowghat taluks, etc., and the continuance of the nursery is necessary to make available quality coconut seedlings to the growers.
8. Duration of the extension: 5 years from 11-7-1960 to 10-7-1965.
9. Cost of extension under the following heads:
  - a. *Expenditure*  
Recurring: Rs. 28,136.

|                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Non-recurring                                      | Nil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Share of the Committee (33 $\frac{1}{3}$ %):       | Rs. 9,379.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Share of the State Government (66 $\frac{2}{3}$ %) | Rs. 18,757.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| b. <i>Receipts:</i>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Share of the Committee (33 $\frac{1}{3}$ %):       | Rs. 3,560                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Share of the State Govt. (66 $\frac{2}{3}$ %):     | Rs. 7,120.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| c. <i>Net cost:</i>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Share of the Committee:                            | Rs. 5,819.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Share of the State Government:                     | Rs. 11,637.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 10. Remarks of the Secretariat on the proposal:    | <p>The target for distribution under the original scheme is 3,000 seedlings per annum. A total number of 8,571 seedlings only were distributed during the 4 years 1955-56 to 1958-59. The reasons for the short-fall have not been given. To meet the growing demands of the cultivators in the area, it is now proposed to raise the target to 4,200 seedlings per annum.</p> <p>The expenditure and receipts during the extension period are proposed to be shared by the Committee and the State Government in the proportion of 1:2 as stipulated in the "General Conditions applicable to grants made by the Committee".</p> |



The Committee may now decide whether they would approve of the proposal for extension of the coconut nursery, Wadakkancherry for 5 years from 11-7-'60 to 10-7-'65 at a net cost to the Committee not exceeding Rs. 5,819.

**Extension proposals for the coconut nursery,  
Wadakkancherry for a period of 5 years (11-7-1960)**

1. The scheme was started as per G. P. Order D. Dis. 2394/54 FD dated 25-5-55. The scheme was started from 11-7-1955. It is located in the compound of the manure depot, Wadakkancherry.

**2. *Object of the scheme.***

The nursery was started with a view to produce and distribute quality seedlings in areas in Talappilly taluk and neighbouring taluks. The target of the nursery as fixed for the 5 years is 4000 seednuts per year.

3. Besides the requirement of quality coconut seedlings for under-planting there is scope for expansion of coconut cultivation in Talappilly, Chowghat taluks etc., to some extent and it is necessary to make available quality seedlings in sufficient quantities to cultivators. The only one nursery run by Government from where the cultivators of these taluks can get quality seedlings without much difficulty is the one at Wadakkancherry and it is necessary to continue this nursery for another five years. The present target of 4000 seeds is not sufficient to meet the growing demands for quality seedlings. It is, therefore, necessary to increase the target to 8000 seednuts. But, there is scope in the present site to increase the target to 6000 only. If the target is increased to 6000 the growing demands of the cultivators will be satisfied to that extent atleast though not in full. Moreover this will be an encouragement to cultivators to expand their coconut cultivation since they are able to get quality seedlings within their easy reach and at reasonable rate.

4. Review of the work done till date.

a) Seednuts planted etc.

| Year    | No. of seednuts planted | No. of seednuts germinated | No. of quality seedlings distributed |
|---------|-------------------------|----------------------------|--------------------------------------|
| 1955-56 | 2000                    | 1400                       | 1210                                 |
| 1956-57 | 2000                    | 1800                       | 1590                                 |
| 1957-58 | 4000                    | 3543                       | 2771                                 |
| 1958-59 | 4000                    | 3521                       | 3000                                 |

b) The nursery staff explained to the cultivators the advantages of planting quality seedlings and also advised them to remove uneconomic trees and plant quality seedlings in their places. Necessary advices in filling up the gaps were also given to the cultivators. As a result of the propaganda given by the staff and other officers of the Department the cultivators have become convinced of the economical advantages in planting of quality seedlings, thereby the demand of the quality seedlings are growing year after year.

5. The coconut nursery scheme, Wadakkancherry has to be continued for 5 years from 11-7-1960 for production and distribution of quality seedlings. The target for each year may be as shown below:-

| year    | Target of seeds | Target of seedlings |
|---------|-----------------|---------------------|
| 1960-61 | 6000            | 4200                |
| 1961-62 | 6000            | 4200                |
| 1962-63 | 6000            | 4200                |
| 1963-64 | 6000            | 4200                |
| 1964-65 | 6000            | 4200                |

As already stated the present target is only 4000 and the number of seedlings expected is only 2800. The demand for coconut seedlings is so great that the nursery cannot cope with the demand. Moreover the seedlings raised in this nursery are recognised to be far superior than those available from private agencies. This is the only Government nursery which supplies quality seedlings to the cultivators of Talapilly, Chowghat taluks



etc., where there is some scope for the expansion of coconut cultivation; hence the necessity for continuing the nursery and for increasing the target.

6. Venue of work - Ottupara near Wadakkancherry (Government owned site)

7. *Staff:-* Staff of the nursery are as given below:-

|          |   |                             |
|----------|---|-----------------------------|
| Fieldman | 1 | Rs. 40-120 with usual D. A. |
| Servants | 2 | Rs. 30-40 each do           |

8. Duration of the scheme: 5 years from 11-7-60 to 10-7-65.

9. Programme of work to be attended by the staff:-

- i) Survey of coconut area round about the coconut nursery to select mother palms and marking mother palms.
- ii) Visiting the gardens during harvest of nuts.
- iii) Harvest and collection of nuts.
- iv) Preservation of nuts till planting.
- v) Sowing nuts, watering and after care.
- vi) Maintenance of records and taking observations.
- vii) Selection of quality seedlings and their disposal.
- vii) Advising coconut cultivators 5 miles around the nursery on planting and care of seedlings.

10. *Finance:-*

|                                                                         | Rs.    |
|-------------------------------------------------------------------------|--------|
| Expenditure                                                             | 28,136 |
| Net expenditure deducting receipts                                      | 17,456 |
| Share of State Government and Indian Central Coconut Committee at 2: 1. |        |
| Share of State Government                                               | 11,637 |
| Share of I. C. C. C.                                                    | 5,819  |

### *Receipts*

|                                                                                                      |             |
|------------------------------------------------------------------------------------------------------|-------------|
| Receipts for 5 years from sale of seedlings 21000 Nos. at 50 nP. each                                | Rs. 10500   |
| By sale of un-germinated nuts and rejected seedlings for 5 years 1800 Nos. per year at Rs. 2 for 100 | 180         |
|                                                                                                      | <hr/> 10680 |

## Appendices.

1. Establishment charges: Year-war expenditure - Statement No. I attached.
2. Contingencies: Please see statement No. II
3. Abstract of expenditure and receipts (Year-war) { Statement No. III attached.

Sd/- for Director of Agriculture.

### Statement No. I Year-war expenditure-establishment charges

| Pay of establishment                                                                                     | Pay     | Dear-<br>ness<br>Pay | D. A.   | Special<br>D. A. | T. A.   | Total<br>allowance | Grand<br>total |
|----------------------------------------------------------------------------------------------------------|---------|----------------------|---------|------------------|---------|--------------------|----------------|
| <b>1st year - 8 months and<br/>21 days. (11-7-63 to<br/>31-3-61) Fieldman at<br/>Rs. 40-120. Rs. 60.</b> |         |                      |         |                  |         |                    |                |
|                                                                                                          | Rs. nP. | Rs. nP.              | Rs. nP. | Rs. nP.          | Rs. nP. | Rs. nP.            | Rs. nP.        |
| 2 Servants Rs. 30-40.                                                                                    | 521.00  | 44.00                | 243.00  | 61.00            | 80.00   | 384.00             | 949.00         |
| Total:                                                                                                   | 520.50  | 88.00                | 348.00  | 208.00           | —       | 556.00             | 1164.50        |
|                                                                                                          | 1041.50 | 132.00               | 591.00  | 239.00           | 80.00   | 940.00             | 2113.50        |
| <b>2nd year 61-62<br/>Fieldman</b>                                                                       |         |                      |         |                  |         |                    |                |
|                                                                                                          | 780.00  | 60.00                | 336.00  | 60.00            | 120.00  | 516.00             | 1356.00        |
| 2 Servants.                                                                                              | 744.00  | 120.00               | 480.00  | 288.00           | —       | 768.00             | 1632.00        |
| Total:                                                                                                   | 1524.00 | 180.00               | 816.00  | 348.00           | 120.00  | 1284.00            | 2988.00        |
| <b>3rd year 62-63<br/>Fieldman</b>                                                                       |         |                      |         |                  |         |                    |                |
|                                                                                                          | 840.00  | 60.00                | 336.00  | 60.00            | 120.00  | 516.00             | 1416.00        |
| 2 Servants.                                                                                              | 768.00  | 120.00               | 480.00  | 288.00           | —       | 768.00             | 1656.00        |
| Total:                                                                                                   | 1608.00 | 180.00               | 816.00  | 348.00           | 120.00  | 1284.00            | 3072.00        |
| <b>4th year 63-64<br/>1 Fieldman</b>                                                                     |         |                      |         |                  |         |                    |                |
|                                                                                                          | 900.00  | 60.00                | 336.00  | 60.00            | 120.00  | 516.00             | 1476.00        |
| 2 Servants.                                                                                              | 792.00  | 120.00               | 480.00  | 288.00           | —       | 768.00             | 1680.00        |
| Total:                                                                                                   | 1692.00 | 180.00               | 816.00  | 348.00           | 120.00  | 1284.00            | 3156.00        |
| <b>5th year 64-65<br/>1 Fieldman</b>                                                                     |         |                      |         |                  |         |                    |                |
|                                                                                                          | 960.00  | 60.00                | 336.00  | 60.00            | 120.00  | 516.00             | 1536.00        |
| 2 Servants.                                                                                              | 816.00  | 120.00               | 480.00  | 288.00           | —       | 768.00             | 1704.00        |
| Total:                                                                                                   | 1776.00 | 180.00               | 816.00  | 348.00           | 120.00  | 1284.00            | 3240.00        |
| <b>3 months &amp; 10 days<br/>in 1965 (1-4-65 to 10-7-65)</b>                                            |         |                      |         |                  |         |                    |                |
| Fieldman I.                                                                                              | 282.00  | 17.00                | 93.00   | 17.00            | 30.00   | 140.00             | 439.00         |
| 2 Servants.                                                                                              | 230.50  | 34.00                | 133.00  | 80.00            | —       | 213.00             | 477.50         |
| Total:                                                                                                   | 512.50  | 51.00                | 226.00  | 97.00            | 30.00   | 353.00             | 916.50         |



# Statement No. II - Contingencies

— 541 —

| Cost of seednuts etc.                                                      | 1st year<br>11-7-60 to<br>31-3-61 | 2nd year<br>61-62 | 3rd year<br>62-63 | 4th year<br>63-64 | 5th year |
|----------------------------------------------------------------------------|-----------------------------------|-------------------|-------------------|-------------------|----------|
|                                                                            | Rs.                               | Rs.               | Rs.               | Rs.               | Rs.      |
| 1. Cost of 6000 nuts                                                       | 1800                              | 1800              | 1800              | 1800              | 1800     |
| 2. Harvesting, packing, transporting and preservation.                     | 300                               | 300               | 300               | 300               | 300      |
| 3. Preparation of nursery beds, spreading sand, bunds, water channels etc. | 90                                | 90                | 90                | 90                | 90       |
| 4. (1) Planting (additional cooly charges at Rs. 1.50 per head)            | 12                                | 12                | 12                | 12                | 12       |
| (2) shading-cost of materials.                                             | 98                                | 98                | 98                | 98                | 98       |
| 5. Prophylactic measures-cost.                                             | 45                                | 45                | 45                | 45                | 45       |
| 6. Fencing                                                                 | 115                               | 115               | 115               | 115               | 115      |
| 7. Other miscellaneous items.                                              |                                   |                   |                   |                   |          |
| (a) Cost of implements                                                     | 50                                | —                 | —                 | —                 | —        |
| (b) Bamboo baskets                                                         | 10                                | 10                | 10                | 10                | 10       |
| (c) Others                                                                 | 50                                | 50                | 50                | 50                | 50       |
| Total:                                                                     | 2570                              | 2520              | 2520              | 2520              | 2520     |

Statement No. III - Abstract of Expenditure and Receipts (Year-wise)

| Expenditure                                                    | 11-7-60 to<br>31-3-61 | 61-62     | 62-63   | 63-64   | 64-65   | 1-4-65 to<br>10-7-65 |
|----------------------------------------------------------------|-----------------------|-----------|---------|---------|---------|----------------------|
|                                                                | Rs.                   | Rs.       | Rs.     | Rs.     | Rs.     | Rs.                  |
| 1. Pay of Establishment                                        | 1041.50               | 1524.00   | 1608.00 | 1692.00 | 1776.00 | 512.50               |
| 2. D. A., D. P. and Special<br>D.A.                            | 992.00                | 1344.00   | 1344.00 | 1344.00 | 1344.00 | 374.00               |
| 3. T. A.                                                       | 80.00                 | 120.00    | 120.00  | 120.00  | 120.00  | 30.00                |
| 4. Contingencies.                                              | 2570.00               | 2520.00   | 2520.00 | 2520.00 | 2520.00 | —                    |
|                                                                | 4683.50               | 5508.00   | 5592.00 | 5676.00 | 5760.00 | 916.50               |
| Total: gross expenditure.                                      |                       | Rs. 28136 |         |         |         |                      |
| Share of State Government (66 $\frac{2}{3}$ %)                 |                       | :         | 18757   |         |         |                      |
| Share of Indian Central Coconut Committee (33 $\frac{1}{3}$ %) |                       |           | 9379    |         |         |                      |
| B. Receipts.                                                   |                       | 2136.00   | 2136.00 | 2136.00 | 2136.00 |                      |
| Total                                                          |                       | Rs. 10680 |         |         |         |                      |
| Share of State Government 66 $\frac{2}{3}$ %                   |                       | Rs. 7120  |         |         |         |                      |
| Share of Indian Central Coconut Committee (33 $\frac{1}{3}$ %) |                       |           | 3560    |         |         |                      |
| Total net Expenditure                                          |                       |           | 17456   |         |         |                      |
| Share of State Government                                      |                       |           | 11637   |         |         |                      |
| Share of Indian Central Coconut Committee                      |                       |           | 5819    |         |         |                      |



## APPENDIX XIX

### Secretary's Note

#### EXTENSION SCHEME

*Subject No. 47.* Comprehensive Coconut Nursery Scheme in Andhra Pradesh-proposal for the extension of.

1. Name of the scheme: Comprehensive Coconut nursery scheme, Andhra Pradesh.
2. Location: Samalkot, Anakapalle and Maruteru.
3. Object of the Scheme: To distribute 52,500 seedlings per annum.
4. Date of commencement of the scheme 10-11-1948.
5. Date of termination of the present scheme 31-3-1961.
6. Results achieved in brief A total number of 3,56,000 seedlings have been distributed from the 3 nurseries till the end of the 1958 planting season.
7. Reasons for extension It is reported that the scheme will help in the expansion of area under and increased production of coconuts in the III Plan period.
8. Duration of extension 2 years 7 months and 9 days (1-4-1961 to 9-11-1963)
9. Cost of extension under the following heads.
  - a) *Expenditure.*

|                                       |               |
|---------------------------------------|---------------|
| Non-recurring                         | Nil           |
| Recurring                             | Rs. 1,23,732. |
| Share of the Committee (15% excluding |               |

|                                                                                                                  |                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| expenditure on removing and packing of seedlings and railway freight)                                            | Rs. 16,650                                                                                                                                                 |
| Share of the State Government                                                                                    | Rs. 94,352                                                                                                                                                 |
| b) <i>Receipts.</i>                                                                                              | Rs. 1,02,129                                                                                                                                               |
| Share of the Committee (15% excluding amount recoverable on account of packing of seedlings and railway freight) | Rs. 13,409.                                                                                                                                                |
| Share of the State Government.                                                                                   | Rs. 88,720                                                                                                                                                 |
| c) Net Cost                                                                                                      | Rs. 21,603                                                                                                                                                 |
| Share of the Committee                                                                                           | Rs. 3,241                                                                                                                                                  |
| Share of the State Government                                                                                    | Rs. 18,362.                                                                                                                                                |
| 10 Remarks of the Secretariat on the proposal                                                                    | 1) The existing staff under the scheme will continue during the extension period also. Their scales of pay have, however, been revised as indicated below: |

| <i>Designation of post</i>   | <i>Old Scale of pay</i> | <i>Revised scale of pay</i> |
|------------------------------|-------------------------|-----------------------------|
| 1. Coconut Nursery Assistant | Rs. 100-5-140-10-220.   | Rs. 150-7½-210-10-300.      |
| 2. Fieldman                  | Rs. 45-2-55-1-60.       | Rs. 50-3-92-4-100.          |
| 3. Demonstration Maistry     | Rs. 20-1-30.            | Rs. 30-1-50.                |
| 4. Upper Division Clerk      | Rs. 80-3-95-5-110.      | Rs. 90-4-110-5-150.         |
| 5. Typist                    | Rs. 45-3-60-2-90        | Rs. 50-3-92-4-120.          |

It is stated that the revised scales correspond to the



scales of pay attached to posts of similar status under the State Governments.

2) At its 25th Meeting, the Committee had sanctioned a proposal for doubling the production target of the 3 nurseries mentioned above during the period 1-4-1958 to 31-3-1961. According to this proposal an additional number of 52,500 seedlings will be produced per annum in the nurseries. This programme of work is reported to have commenced on 7-11-1958. Proposal for continuing the work beyond 31-3-'61 has, however, not been forwarded by the Director of Agriculture. It will be placed for the Committee's consideration when it is received.

3) The Scheme has been received from the Director of Agriculture, Andhra Pradesh. The State Government have not yet communicated their approval for the extension proposal.

The Committee may now decide whether they would approve of the proposal for the continuance of the coconut nurseries at Samalkot, Anakapalle and Maruteru from 1-4-1961 to 9-11-1963 at a net cost to the Committee of Rs. 3,241.00 subject to the State Government approving of the scheme.

The subject may first be considered by the Agricultural Research and Development Sub-Committee (Development and Extension Wing).

**Proposals for the continuance of the scheme for the establishment of comprehensive coconut nurseries at Samalkot, Anakapalli and Maruteru**

1. *Name of the scheme with location.*

Scheme for the establishment of comprehensive Coconut Nurseries at Samalkot, Anakapalli and Maruteru. The centres are located in East Godavari, West Godavari, and Visakhapatnam Districts respectively in Andhra Pradesh State.

2. *Objective (as distinct from technique (C. F. IV)*

The object of the scheme is to maintain and supply quality coconut seedlings to the growers and to bring more area under the Coconut.

3. *Work already done on the subject in India and abroad and the reasons for the proposed investigation.*

The nursery scheme started functioning since November, 1948. A total of 3,56,000 quality seedlings were distributed upto end of 1958 planting season.

4. *Technique proposed to be adopted for investigation.*

The criteria fixed as a result of research work done at the Coconut Research Station for selection of mother palms, seednuts and seedlings will be adopted by the staff in the scheme. The targets fixed for each centre are as follows:-

| Centre     | Seednuts | Quality seedlings |
|------------|----------|-------------------|
| Smalkot    | 40, 000  | 30,000            |
| Anakapalli | 20,000   | 15,000            |
| Maruteru   | 10,000   | 7,500             |
| Total      | 70,000   | 52,500            |



The programme of work envisaged in the scheme is given below:—

- i) Selection of mother palms for collection of seednuts.
- ii) Selection and purchase of seednuts.
- iii) Storing and preserving of seed coconuts.
- iv) Control of pests and diseases.
- v) Nursery studies.
- vi) Removing and supplying selected seedlings.
- vii) Giving technical advice to coconut growers on improved methods of cultivation and inspection of coconut gardens, to the extent possible.

5. *Duration of the investigation.*

The scheme is proposed to be continued from 1-4-'61 to 9-11-1963.

6. *Practical utility of the investigation.*

The scheme would help in achieving the targets of area and increased production of coconuts in the State during the Third Plan period.

7. *Facilities available and/or that will be made available by the State Government.*

a) *Supervision.* The staff and the work in the scheme will continue to be in immediate administrative control of the superintendents of the respective Research Stations, Samalkot, Anakapalle and Maruteru and under the over-all control and guidance of the Oilseeds Specialist, Agricultural Research Institute, Rajendranagar.

(b) *Land (Area):* The present area which is under the existing nursery schemes on the respective Agricultural Research Stations will continue to be utilised for the nursery work.

*Irrigation:* As the above centres are located in the premises of the Government Agricultural Farms, facilities for irrigation and cultivation etc., will continue to be made available for the coconut nurseries.

(c) *Equipment*: The existing scheme is fairly equipped well and minimum provision has been made for purchase of new gunnies, and other dead stock articles to the extent that is necessary for the proposed extension period.

8. *Recurring expenditure*:

*Details of expenditure are appended*

(a) Pay of officer with details: Nil.

(b) Pay of Establishment with details:

i) Expenditure Rs. 34,261

ii) Strength of staff:

|               | Samalkot | Anakapalle | Maruteru | Rajendra-<br>nagar | Total |
|---------------|----------|------------|----------|--------------------|-------|
| Assistants    | 1        | 1          | 1        | —                  | 3     |
| Fieldmen      | 2        | 1          | —        | —                  | 3     |
| Demonstration |          |            |          |                    |       |
| Maistries     | 2        | —          | 1        | —                  | 3     |
| U. D. C.      | —        | —          | —        | 1                  | 1     |
| Typist        | —        | —          | —        | 1                  | 1     |
| Total         | 5        | 2          | 2        | 2                  | 11    |

|                                                                                                                                                                                    | Rs.      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| (c) Dearness Allowance                                                                                                                                                             | 13,304   |
| (d) Other allowances—Compensatory City Allowance                                                                                                                                   | 504      |
| (e) Leave Salary                                                                                                                                                                   | —        |
| (f) Committee's Provident Fund contribution                                                                                                                                        | —        |
| (g) Travelling Allowance                                                                                                                                                           | 4,280    |
| (h) Contingencies                                                                                                                                                                  | 71,383   |
| 9. Receipts anticipated                                                                                                                                                            | 1,02,129 |
| 10. Share of the Committee in expenditure                                                                                                                                          | 16,650   |
| 11. Name and address of technical Officer-in-charge of the scheme with whom correspondence may be entered into directly on technical matters pertaining to the work of the scheme: |          |



M. P. Narasimha Rao., B.Sc., (Ag.)  
Assoc, I. A. R. I.,  
Oilseeds Specialist,  
Agricultural Research Institute,  
Rajendranagar, Hyderabad-Deccan.

12. Certified that:

- (a) The scale of pay, allowances, etc., proposed above are those admissible to persons of corresponding status employed under the State Government etc.
- (b) The present scheme cannot be combined with any scheme, that is
- (i) financed entirely by the Centre and State Governments, Universities or Private Institutions from their funds

Or

- (ii) financed by or submitted to any of the Central Commodity Committees or the Indian Council of Agricultural Research.
- (c) Necessary provision for the scheme will be made in the State budget in anticipation of the sanction of the scheme by the Committee.

Sd. For Oilseeds Specialist.

## FINANCIAL STATEMENT

### Comprehensive Coconut Nursery Scheme Period from 1-4-1961 to 9-11-1963

| A. Expenditure:                | Rs.             |
|--------------------------------|-----------------|
| I. 1) Pay of Establishment     | 34,261          |
| 2) Dearness Allowance          | 13,304          |
| 3) Compensatory City Allowance | 504             |
| 4) Travelling Allowance        | 4,280           |
| 5) Other charges               | 71,383          |
| Total                          | <u>1,23,732</u> |

Amount to be borne entirely by State Government.

|                                                                                                  |               |
|--------------------------------------------------------------------------------------------------|---------------|
|                                                                                                  | Rs.           |
| II. Charges on removing of seedlings                                                             | 6,320         |
| Railway freight on seedlings                                                                     | 6,410         |
|                                                                                                  | <u>12,730</u> |
| III. Amount to be shared by I. C. Coc. C. and the State Government on 15:85 basis (I minus II)   | 1,11,002      |
| B. Receipts:                                                                                     |               |
| IV. Total receipts                                                                               | 1,02,129      |
| V. Deduct amounts incurred under removing etc., and railway freight on seedlings and recoverable | 12,730        |
| VI. Amount of receipts to be shared between I. C. Coc. C. and State Government on 15:85 basis.   | 89,399        |

*Share of I.C.Coc. C.*

15% of Rs. 1,11,002=16,650

15% of Rs. 89,399=13,409

Net expenditure 3,241

*Share of State Government*

i) 85% of Rs. 1,11,002=94,352

ii) Additional amount to be borne entirely by State Government

12,730

Gross expenditure 1,07,082

iii) 85% of Rs. 89,399 75,990

iv) Additional amount to be credited to

State Government 12,730

Total receipts 88,720

Net expenditure 18,362

Sd. for Oilseeds Specialist.



# Comprehensive Coconut Nurseries Scheme

From 1-4-1961 to 9-11-1953 Estimate of Expenditure

| S. No.                          | Name of the Post       | Scale of pay and No. of Post |                        | 1-4-61     | 1-4-62     | 1-4-63     | Total |
|---------------------------------|------------------------|------------------------------|------------------------|------------|------------|------------|-------|
|                                 |                        | Basic pay                    | 3                      | to 31-3-62 | to 31-3-63 | to 9-11-63 |       |
| 1                               | 2                      |                              | 4                      | 5          | 6          | 7          | 8     |
| <b>I Pay of Establishment:</b>  |                        |                              |                        |            |            |            |       |
|                                 |                        |                              | <b>Samalkot Centre</b> |            |            |            |       |
| 1) Coconut Nursery Assistant.   | 150-7½-210-10-300/172½ | 1                            |                        | 2000       | 2160       | 1370       | 5600  |
| 2) Fieldman No. I               | 50-3-92-4-100/77       | 1                            |                        | 924        | 960        | 610        | 2494  |
| 3) Fieldman No. II.             | 50-3-92-4-100-174      | 1                            |                        | 888        | 924        | 526        | 2338  |
| 4) Demonstration Maistry No. I  | 30-1-50/35             | 1                            |                        | 420        | 432        | 270        | 1122  |
| 5) Demonstration Maistry No. II | do.                    | 1                            |                        | 420        | 432        | 270        | 1122  |
| Total of pay                    |                        |                              |                        | 4722       | 4908       | 3046       | 12676 |
| <b>II Dearness allowance-</b>   |                        |                              |                        |            |            |            |       |
|                                 |                        |                              | <b>Rate of D. A.</b>   |            |            |            |       |
| 1) Coconut Nursery Assistant    | Rs. 40                 | -                            |                        | 480        | 516        | 300        | 1296  |
| 2) Fieldman No. I               | Rs. 36                 | -                            |                        | 432        | 432        | 264        | 1128  |
| 3) Fieldman No. II              | Rs. 36                 | -                            |                        | 432        | 432        | 264        | 1128  |

| 1 | 2                               | 3      | 4 | 5    | 6    | 7    | 8    |
|---|---------------------------------|--------|---|------|------|------|------|
|   |                                 |        |   |      |      |      |      |
|   | 4) Demonstration Maistry No. I  | Rs. 30 | - | 360  | 360  | 220  | 940  |
|   | 5) Demonstration Maistry No. II | Rs. 30 | - | 360  | 360  | 220  | 940  |
|   | Total of D. A.                  |        |   | 2064 | 2100 | 1268 | 5432 |

### III Travelling allowance.

Travelling allowance for the  
Nursery Staff of Samalkot  
Centre

|      |     |     |      |
|------|-----|-----|------|
| 1100 | 650 | 200 | 1950 |
| 1100 | 650 | 200 | 1950 |

Total T. A.

### IV Contingencies:

- 1) Cost of coconut seednuts  
@ Rs. 280 per 1000 nuts in-  
cluding 20% premium.
- 2) Harvesting, packing and  
transporting etc. at Rs. 50  
per 1000 nuts.
- 3) Cost of gunnies and repairs  
of old ones.
- 4) Preparing the nursery area.
- 5) Planting seednuts, watering,  
weeding and maintenance of  
nursery till they are dis-  
posed of.

|       |      |      |       |
|-------|------|------|-------|
| 11200 | 7000 | -    | 18200 |
| 2000  | 1250 | -    | 3250  |
| 30    | -    | -    | 30    |
| 80    | 20   | -    | 100   |
| 3500  | 3000 | 1800 | 8300  |



| 1 | 2                                                                     | 3 | 4 | 5     | 6     | 7    | 8     |
|---|-----------------------------------------------------------------------|---|---|-------|-------|------|-------|
|   | 6) Removing and packing etc., of seedlings.                           |   |   | 1200  | 1000  | 1000 | 3200  |
|   | 7) Railway freight charges on seedlings.                              |   |   | 1560  | 1100  | 1100 | 3760  |
|   | 8) Cost of dead stock articles                                        |   |   | 20    | 20    | —    | 40    |
|   | 9) Preparation of temporary thatched shed.                            |   |   | 20    | 50    | 10   | 80    |
|   | 10) Office contingencies (like service postage, Kerosene oil)         |   |   | 400   | 400   | 600  | 1400  |
|   | 11) Miscellaneous ( Removing ungerminated sprouts and sundry items. ) |   |   | 200   | 200   | 200  | 600   |
|   |                                                                       |   |   | 20210 | 14040 | 4710 | 38960 |
|   |                                                                       |   |   | Total |       |      |       |

### Anakapalle Centre

#### I Pay of Establishment:

|                           |                           |   |      |      |      |      |
|---------------------------|---------------------------|---|------|------|------|------|
| 1) Coconut Nursery Asst.  | 150-7½-210-10-300 Rs. 180 | 1 | 2160 | 2250 | 1430 | 5840 |
| 2) Fieldman.              | 50-3-92-4-100 Rs. 83      | 1 | 996  | 1032 | 652  | 2680 |
| 3) Demonstration Maistry. | 30-1-50 Rs. 34            | 1 | 408  | 420  | 264  | 1092 |
|                           | Total of pay              |   | 3564 | 3702 | 2346 | 9612 |

— 553 —

| 1   | 2                                                                     | 3                    | 4 | 5    | 6    | 7    | 8    |
|-----|-----------------------------------------------------------------------|----------------------|---|------|------|------|------|
| II  | <i>Dearness Allowance:</i>                                            | <i>Rate of D. A.</i> |   |      |      |      |      |
|     | 1) Coconut Nursery Asst.                                              | Rs. 43               |   | 516  | 516  | 315  | 1347 |
|     | 2) Fieldman.                                                          | Rs. 36               |   | 432  | 432  | 264  | 1128 |
|     | 3) Demonstration Maistry.                                             | Rs. 30               |   | 360  | 360  | 220  | 940  |
|     |                                                                       | Total of D. A.       |   | 1308 | 1308 | 799  | 3415 |
| III | <i>Travelling allowance:</i>                                          |                      |   |      |      |      |      |
|     | Travelling allowance for staff of Anakapalle centre.                  |                      |   | 650  | 380  | 100  | 1130 |
|     |                                                                       | Total of T. A.       |   | 650  | 380  | 100  | 1130 |
| IV  | <i>Contingencies:</i>                                                 |                      |   |      |      |      |      |
|     | 1) Cost of coconut seednuts at Rs. 280 per 1000 including 20% premium |                      |   | 5600 | 3500 | -    | 9100 |
|     | 2) Harvesting, packing and transporting at Rs. 50 per 1000 nuts.      |                      |   | 1000 | 625  | -    | 1625 |
|     | 3) Cost of gunnies and repair of old ones.                            |                      |   | 20   | -    | -    | 20   |
|     | 4) Preparing nursery area.                                            |                      |   | 40   | 10   | -    | 50   |
|     | 5) Planting seednuts etc., watering and maintenance of the Nursery.   |                      |   | 2200 | 2000 | 1200 | 5400 |



| I  | 2                                                                    | 3              | 4 | 5     | 6    | 7    | 8     |
|----|----------------------------------------------------------------------|----------------|---|-------|------|------|-------|
|    | 6) Removing and packing etc.<br>of seedlings.                        |                |   | 900   | 700  | 700  | 2300  |
|    | 7) Railway freight charges<br>on seedlings.                          |                |   | 800   | 600  | 600  | 2000  |
|    | 8) Cost of dead stock articles.                                      |                |   | 20    | 20   | -    | 40    |
|    | 9) Preparation of thatched<br>shed.                                  |                |   | 10    | 50   | 10   | 70    |
|    | 10) Other contingencies.                                             |                |   | 200   | 200  | 300  | 700   |
|    | 11) Miscellaneous (Removing<br>of ungerminated nuts<br>sprouts etc.) |                |   | 150   | 150  | 150  | 450   |
|    | Total contingencies.                                                 |                |   | 10940 | 7855 | 2960 | 21755 |
|    | <b>Maruteru Centre</b>                                               |                |   |       |      |      |       |
| I  | <i>Pay of Establishment:</i>                                         |                |   |       |      |      |       |
|    | 1) Coconut Nursery Asst.                                             | 150-7½-210-10- | 1 | 2160  | 2250 | 1430 | 5840  |
|    |                                                                      | 300 Rs. 180    |   | 420   | 432  | 270  | 1122  |
|    | 2) Demonstration Maistry.                                            | 30-1-50 Rs. 35 | 1 | 2580  | 2682 | 1700 | 6962  |
|    | Total of Pay                                                         |                |   |       |      |      |       |
|    | <i>Rate of D. A.</i>                                                 |                |   |       |      |      |       |
|    |                                                                      | Rs. 43         |   | 516   | 516  | 315  | 1347  |
|    |                                                                      | Rs. 30         |   | 360   | 360  | 220  | 940   |
|    | Total of D. A.                                                       |                |   | 876   | 876  | 535  | 2287  |
| II | <i>Dearness allowance:</i>                                           |                |   |       |      |      |       |
|    | 1) Coconut Nursery Asst.                                             |                |   |       |      |      |       |
|    | 2) Demonstration Maistry.                                            |                |   |       |      |      |       |

| 1   | 2                                                                                  | 3              | 4 | 5    | 6    | 7   | 8       |
|-----|------------------------------------------------------------------------------------|----------------|---|------|------|-----|---------|
| III | Travelling allowance:<br>Maruteru centre.                                          |                |   | 350  | 220  | 80  | 650     |
|     |                                                                                    | Total of T. A. |   | 350  | 220  | 80  | 650     |
| IV  | Contingencies:                                                                     |                |   |      |      |     |         |
|     | 1) Cost of seed coconuts at<br>Rs. 280 per 1000 nuts in-<br>cluding 20% premium.   |                |   | 2800 | 1750 | —   | 4550    |
|     | 2) Harvesting, packing and<br>transporting of seednuts<br>at Rs. 50 per 1000 nuts. |                |   | 500  | 313  | —   | 813     |
|     | 3) Cost of gunnies and repair<br>of old ones.                                      |                |   | 10   | —    | —   | 10      |
|     | 4) Preparing Nursery area.                                                         |                |   | 20   | 10   | —   | 30      |
|     | 5) Planting seednuts, water-<br>ing, weeding and mainte-<br>nance of the nursery.  |                |   | 1000 | 1000 | 400 | 2400    |
|     | 6) Removing and packing<br>etc., of seedlings.                                     |                |   | 320  | 250  | 250 | 820     |
|     | 7) Railway freight on seed-<br>lings.                                              |                |   | 250  | 200  | 200 | 650     |
|     | 8) Cost of dead stock articles                                                     |                |   | 10   | 10   | —   | 20      |
|     | 9) Preparation of temporary<br>thatched shed.                                      |                |   | 10   | 30   | 10  | 50      |
|     |                                                                                    |                |   |      |      |     | — 556 — |



| 1  | 2                                                                    | 3                                                                     | 4 | 5        | 6        | 7       | 8        |
|----|----------------------------------------------------------------------|-----------------------------------------------------------------------|---|----------|----------|---------|----------|
|    | 10) Office contingencies (Kerosene oil etc., service postage.)       |                                                                       |   | 150      | 150      | 250     | 550      |
|    | 11) Miscellaneous (Removing ungerminated nuts and sundry items etc.) |                                                                       |   | 75       | 75       | 75      | 225      |
|    | Total contingencies                                                  |                                                                       |   | 5145     | 3788     | 1185    | 10118    |
|    | <b>Rajendranagar Centre</b>                                          |                                                                       |   |          |          |         |          |
| I  | <i>Pay of Establishment:</i>                                         |                                                                       |   |          |          |         |          |
|    | 1) U. D. C.                                                          | 90-4-110-5-150<br>Rs. 98                                              | 1 | Rs. 1176 | Rs. 1224 | Rs. 777 | Rs. 3177 |
|    | 2) Typist.                                                           | 50-3-92-4-120<br>Rs. 56                                               | 1 | 672      | 708      | 454     | 1834     |
|    |                                                                      | Total Pay                                                             |   | 1848     | 1932     | 1231    | 5011     |
| II | <i>Dearness Allowance:</i>                                           | <i>Rate of D. A.</i>                                                  |   |          |          |         |          |
|    | 1) U. D. C.                                                          | Rs. 34<br>for 1961-62 and<br>Rs. 36 during<br>1962 - 63 and<br>63-64. |   | 408      | 432      | 264     | 1104     |
|    | 2) Typist.                                                           | Rs. 34                                                                |   | 408      | 408      | 250     | 1066     |
|    |                                                                      | Total D. A.                                                           |   | 816      | 840      | 514     | 2170     |

| 1   | 2                                                               | 3           | 4 | 5   | 6   | 7   | 8   |
|-----|-----------------------------------------------------------------|-------------|---|-----|-----|-----|-----|
| III | <i>Travelling Allowance:</i>                                    |             |   |     |     |     |     |
|     | T. A. for Oilseeds Specialist<br>and the staff at Rajendranagar |             |   |     |     |     |     |
|     |                                                                 |             |   | 150 | 150 | 250 | 550 |
|     |                                                                 | Total T. A. |   | 150 | 150 | 250 | 550 |
| IV  | <i>Compensatory Allowance (Higher cost of living)</i>           |             |   |     |     |     |     |
|     | 1) U. D. C.                                                     | Rs. 8       |   | 96  | 96  | 60  | 252 |
|     | 2) Typist.                                                      | Rs. 8       |   | 96  | 96  | 60  | 252 |
|     | Total Compensatory Allowance.                                   |             |   | 192 | 192 | 120 | 504 |
| V   | <i>Contingencies:</i>                                           |             |   |     |     |     |     |
|     | Office Contingencies ( like<br>service postage etc. )           |             |   |     |     |     |     |
|     |                                                                 |             |   | 125 | 125 | 300 | 550 |
|     | Total contingencies                                             |             |   | 125 | 125 | 300 | 550 |



**Comprehensive Coconut Nursery Scheme  
from 1-4-1961 to 9-11-1963  
Estimates of receipts.**

| Sl. No. | Particulars | 1-4-61<br>to<br>31-3-62 | 1-4-62<br>to<br>31-3-63 | 1-4-63<br>to<br>9-11-63 | Total |
|---------|-------------|-------------------------|-------------------------|-------------------------|-------|
| 1       | 2           | 3                       | 4                       | 5                       | 6     |

**Samalkot Centre**

|   |                                                                                                                  |               |               |               |               |
|---|------------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|---------------|
| 1 | By sale of Coconut seedlings at Rs.0.50 nP. per seedling.                                                        | Rs.<br>19,578 | Rs.<br>15,000 | Rs.<br>15,000 | Rs.<br>49,579 |
| 2 | Removing, packing and transport of seedlings.                                                                    | 1,200         | 1,000         | 1,000         | 3,200         |
| 3 | Railway freight charges on seedlings.                                                                            | 1,560         | 1,100         | 1,100         | 3,760         |
| 4 | Miscellaneous receipts (by sale of dead stock articles etc., and ungerminated nuts at the closure of the scheme) | 20            | 20            | 1,300         | 1,340         |
|   | <b>Total</b>                                                                                                     | <b>22,359</b> | <b>17,120</b> | <b>18,400</b> | <b>57,879</b> |

**Anakapalle Centre**

|   |                                                                                                                  |               |              |              |               |
|---|------------------------------------------------------------------------------------------------------------------|---------------|--------------|--------------|---------------|
| 1 | By sale of Coconut seedlings at Rs. 0.50 nP. per seedling.                                                       | 11,300        | 7,500        | 7,500        | 26,300        |
| 2 | Removing, packing and transport of seedlings.                                                                    | 900           | 700          | 700          | 2,300         |
| 3 | Railway freight charges on seedlings.                                                                            | 800           | 600          | 600          | 2,000         |
| 4 | Miscellaneous receipts (on sale of dead stock articles etc., and ungerminated nuts at the closure of the scheme) | 10            | 10           | 600          | 620           |
|   | <b>Total</b>                                                                                                     | <b>13,010</b> | <b>8,810</b> | <b>9,400</b> | <b>31,220</b> |

| 1                                                                                                                  | 2            | 3            | 4            | 5             | 6 |
|--------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------|---------------|---|
| <b>Maruteru Centre</b>                                                                                             |              |              |              |               |   |
| 1 By sale of coconut seedlings at Rs. 0.50 nP. per seedling.                                                       | Rs.<br>3,750 | Rs.<br>3,750 | Rs.<br>3,750 | Rs.<br>11,250 |   |
| 2 Removing, packing and transport of seedlings.                                                                    | 320          | 250          | 250          | 820           |   |
| 3 Railway freight charges on seedlings.                                                                            | 250          | 200          | 200          | 650           |   |
| 4 Miscellaneous receipts (by sale of dead stock articles etc., and ungerminated nuts at the closure of the scheme) | 5            | 5            | 300          | 310           |   |
| Total                                                                                                              | 4,325        | 4,205        | 4,500        | 13,030        |   |
| Grand total                                                                                                        | 39,694       | 30,135       | 32,300       | 1,02,129      |   |

**Abstract of expenditure – Comprehensive Coconut Nursery Scheme, Andhra Pradesh State.**

| Sl. No. | Particulars          | Name of the Centre | 1-4-1961 to 31-3-1962 | 1-4-'62 to 31-3-'63 | 1-4-'63 to 9-11-'63 | Total  |
|---------|----------------------|--------------------|-----------------------|---------------------|---------------------|--------|
| 1       | 2                    | 3                  | 4                     | 5                   | 6                   | 7      |
|         |                      |                    | Rs.                   | Rs.                 | Rs.                 | Rs.    |
| 1       | Pay of Establishment | Samalkot           | 4,722                 | 4,908               | 3,046               | 12,676 |
|         |                      | Anakapalle         | 3,564                 | 3,702               | 2,346               | 9,612  |
|         |                      | Maruteru           | 2,580                 | 2,682               | 1,700               | 6,962  |
|         |                      | Rajendranagar      | 1,848                 | 1,932               | 1,231               | 5,011  |
|         |                      | Total              | 12,714                | 13,224              | 8,323               | 34,261 |
| 2       | Dearness Allowance   | Samalkot           | 2,064                 | 2,100               | 1,268               | 5,432  |
|         |                      | Anakapalle         | 1,308                 | 1,308               | 799                 | 3,415  |
|         |                      | Maruteru           | 876                   | 876                 | 876                 | 2,287  |
|         |                      | Rajendranagar      | 816                   | 840                 | 524                 | 2,170  |
|         |                      | Total              | 5,064                 | 5,124               | 3,467               | 13,304 |



|                                |                |        |        |       |        |
|--------------------------------|----------------|--------|--------|-------|--------|
| 3. Compensatory City Allowance | Samalkot       | —      | —      | —     | —      |
|                                | Anakapalle     | —      | —      | —     | —      |
|                                | Maruteru       | —      | —      | —     | —      |
|                                | Rajendra-nagar | 192    | 192    | 120   | 504    |
|                                | Total          | 192    | 192    | 120   | 504    |
| 4. Travelling Allowance        | Samalkot       | 1,100  | 650    | 200   | 1,950  |
|                                | Anakapalle     | 650    | 380    | 100   | 1,130  |
|                                | Maruteru       | 350    | 220    | 80    | 650    |
|                                | Rajendra-nagar | 150    | 150    | 250   | 550    |
|                                | Total          | 2,250  | 1,400  | 630   | 4,280  |
| 5. Other charges               | Samalkot       | 20,210 | 14,040 | 4,710 | 38,960 |
|                                | Anakapalle     | 10,940 | 7,355  | 2,960 | 21,755 |
|                                | Maruteru       | 5,145  | 3,788  | 1,185 | 10,118 |
|                                | Rajendra-nagar | 125    | 125    | 300   | 550    |
|                                | Total          | 36,420 | 25,808 | 9,155 | 71,383 |

Sd/- for Oilseeds Specialist.

## APPENDIX XX

### Secretary's Note

#### NEW SCHEME

*Subject No. 66.* Parasite Breeding Station Scheme, Puri, Orissa—Proposal for.

1. Name of the Scheme: Scheme for the establishment of a parasite breeding station for the biological control of *Nephantis serinopa* at Puri in Orissa.
2. Location of the Scheme: Puri in Orissa State.
3. Object of the Scheme: Rearing and releasing parasites of *Nephantis serinopa* to control the pest.

4. Duration of the Scheme: 2 years.

5. Cost of the scheme under the following heads. :

(i) *Expenditure.*

Recurring : Rs. 20,410

Non-recurring : Nil

Total cost : Rs. 20,410

Share of the Committee : Rs. 10,205

Share of the State

Government : Rs. 10,205

(ii) *Receipts.*

Share of the Committee : Nil

Share of the State

Government : Nil

(iii) *Net Cost.*

Share of the Committee : Rs. 10,205

Share of the State

Government : Rs. 10,205

6. Remarks of the Secretariat on the proposal. (1) The Scheme under report was originally sent by the Director of Agriculture and Food Production, Orissa for consideration at the VI Meeting of the Central Supervisory Body for the implementation of the Coconut Schemes under the II Five Year Plan. The scheme, however, was not considered at the meeting held at Shillong on 4-5-1959 as it was received here too late. The State Government have since communicated their approval of the proposal submitted by the Director of Agriculture and Food Production.



In the scheme it is stated that Dr. E. S. Narayanan, Head of the Division of Entomology, Indian Agricultural Research Institute, New Delhi who visited the State had suggested the establishment of a parasite breeding station in Puri on the pattern of similar stations functioning in Kerala and Andhra Pradesh.

The staff provided under the scheme consists of one graduate Entomologist, two matriculate Field Assistants and two Laboratory Attendants. In this connection it may be pointed out that according to the recommendation of Dr. E.S. Narayanan which has been approved by the Indian Central Coconut Committee, only the following staff need be provided for parasite breeding stations:-

- 1) Field Assistant (Matriculate)-1
- 2) Laboratory Attendants-2

In Andhra Pradesh, the Razole station has one Assistant Entomologist and 2 Fieldmen and the Ambajipetta station one Assistant Entomologist and one Fieldman. As the scheme in Orissa is to be executed by the State Entomologist it would appear that the staff

proposed in the scheme may be reduced to one Field Assistant (Matriculate) and two Laboratory Attendants.

According to the proposal the scheme was to have started on 1-4-1959. As the scheme requires the prior approval of the Committee and the Government of India, the scheme may be started on 1-4-1960.

(4) According to the scheme an amount of Rs. 750 being the cost of furniture for the station, is proposed to be shared by the Committee and the State Government together with items of recurring expenditure on the scheme. It may be pointed out in this connection that the cost of furniture is a non-recurring expenditure which has to be met entirely by the Orissa Government according to the "General Conditions" applicable to grants made by the Committee.

(5) If the suggestions referred to in comments (2), (3) and (4) are approved, the total expenditure on the scheme to be shared for a period of 2 years from 1-4-1960 to 31-3-1962 would be Rs. 13,398 as per the statement attached (vide Annexure II). The Committee's



share (50%) of the recurring expenditure will be of the order of Rs. 6,699.00.

The Committee may now decide whether they would approve of the scheme and the statement of expenditure given in Annexure II and agree to meet an expenditure of Rs. 6,699.00 for a period of 2 years from 1-4-1960.

The subject may be considered first by the Agricultural Research and Development Sub-Committee (Development and Extension Wing).

## ANNEXURE I

Scheme for the establishment of a parasite breeding station for the biological control of *Nephantis serinopa* Meyr at Puri in Orissa.

I. *Introduction.* The black-headed caterpillar, *Nephantis serinopa* Meyr is one of the most serious pests of the coconut palm in many parts of India, Ceylon and Burma. The pest causes intensive damage to the coconut palms, often times bringing about a steep fall of 75% in the production of nuts. It also causes the nuts to fall from the trees when they are still young and immature.

II. In Orissa during 1937-38, the coconut palms in Bir-Balabhadrapur village in Puri district were said to have been attacked by this pest. The attack continued for 3 years and later subsided. In 1947 also there was a severe attack in Bir-Balabhadrapur, Nilambarpur, and the villages up to Bir-Harekrishnapur. The attack now (1958-59) is, however, more intensive and extensive ranging from the belt of sandy ridges along the sea coast at

Puri to the interior fertile alluvial tract. The attack is more severe in dry places than moist ones.

The severity of the present attack appears to be due to the absence of natural parasites which kept the pest under control in previous years. It is well known that the state suffered severe drought during 1957-58. Due to this there was a considerable period of dry weather and high temperature in the area. As a result probably the natural parasites might have been wiped out in large numbers and the pest attack has increased considerably. The situation of the palms in several villages is very alarming.

Dr. E. S. Narayanan, Head of the Department of Entomology, Indian Agricultural Research Institute, New Delhi paid a visit to this State in February, 1959 to attend the All-India Rice Workers' conference at Cuttack. He was requested to visit the affected areas in Puri district and was very kind to see a number of places affected by this pest on 22nd Feb. 1959. He expressed a desire that a parasite breeding station should be established at once in this area on usual pattern as done in Kerala and Andhra and as recommended by the Indian Central Coconut Committee in their Jan. 1959 meeting at Trivandrum. The present scheme is accordingly drafted for the Central Supervisory Body meeting's consideration on the 4th May 1959 at Shillong for immediate implementation. The scheme will be operated from 1st April, 1959 for a period of 2 years in the first instance.

II. *Staff.* One graduate Entomology Assistant (Rs. 175-305), two matriculate Field Assistants (Rs. 50-70) and two Laboratory Assistants (Rs. 30-39) and four mazdoors (Rs. 16-24) will be appointed in the scheme which will be executed by the State Entomologist

## II. *Technical Programme.*

1. Conducting a systematic survey of the infested areas in Puri district, study the natural parasitism and arrange for the release of parasites in the centres of *Nephantis* infestations as and when they are noticed.



2. Multiplication and release of the different parasites on *Nephantis*, namely, *Microbracon brevicornis* Neam, *Perisierola nephantidis* Mens, *Elasmus Nephantidis* Boh, *Trichospilus pupivora* Fer. *Trichogramma minutum* Riby.

3. Try to evolve a suitable technique for rearing the pupal parasites *Stomatoceras sulcatiscutellum* Oil and the larval parasite *Apantales taragamae* Vier.

#### IV. Budget.

##### (a) Expenditure.

| Sl. No. | Particulars.                                                               | Amount required |          | Total |
|---------|----------------------------------------------------------------------------|-----------------|----------|-------|
|         |                                                                            | 1959-'60        | 1960-'61 |       |
| I       | <i>Pay of establishment</i>                                                | Rs.             | Rs.      | Rs.   |
|         | (i) One graduate Entomologist in the scale of Rs. 175-10-215-15-275-EB-305 | 1925            | 2210     | 4135  |
|         | (ii) 2 Matriculate Field Assts. in the scale of Rs. 50-2-70-EB-2-90        | 1100            | 1244     | 2344  |
|         | (iii) 2 Lab. Attendants in the scale of Rs. 30-1-39                        | 660             | 742      | 1402  |
|         | (iv) 4 mazdoors in the scale of Rs. 18-½-24                                | 792             | 864      | 1656  |
|         |                                                                            | 4477            | 5060     | 9537  |
| II      | <i>Allowances</i>                                                          |                 |          |       |
|         | (i) Dearness allowance                                                     | 2123            | 2316     | 4439  |
|         | (ii) Addl. Dearness allowance                                              | 638             | 696      | 1334  |
|         | (iii) Travelling allowance                                                 | 750             | 750      | 1500  |
|         |                                                                            | 3511            | 3762     | 7273  |

### III Contingencies

|                                   |             |             |             |
|-----------------------------------|-------------|-------------|-------------|
| (i) Apparatus & materials         | 1000        | 500         | 1500        |
| (ii) Service postage stamps       | 50          | 50          | 100         |
| (iii) Furniture                   | 500         | 250         | 750         |
| (iv) Petty construction & repairs | 500         | 250         | 750         |
| (v) Miscellaneous                 | 150         | 150         | 300         |
| (vi) Forms and Stationary         | 100         | 100         | 200         |
|                                   | <u>2300</u> | <u>1300</u> | <u>3600</u> |

#### (b) Receipts.

No receipts are expected from this scheme.

The total expenditure of Rs. 20,410 may be shared equally by the Indian Central Coconut Committee and the State Government.

## ANNEXURE II

Statement of expenditure of the scheme for the establishment of parasite breeding stations for the biological control of *Nephantis serinopa* at Puri in Orissa.

| Particulars.                                                            | Amount required |              |              |
|-------------------------------------------------------------------------|-----------------|--------------|--------------|
|                                                                         | 1960-'61        | 1961-'62     | Total        |
| 1 Pay of establishment                                                  | Rs.             | Rs.          | Rs.          |
| (i) One Matriculate Field Assistant in the scale of Rs. 50-2-70-EB-2-90 | 600             | 624          | 1,224        |
| (ii) Two Laboratory Attendants in the scale of Rs. 30-1-39              | 720             | 744          | 1,464        |
| (iii) Four Mazdoors in the scale of Rs. 18- $\frac{1}{2}$ -24           | 864             | 888          | 1,752        |
|                                                                         | <u>2,184</u>    | <u>2,256</u> | <u>4,440</u> |



## 2 Allowances

|                               |              |              |              |
|-------------------------------|--------------|--------------|--------------|
| (i) Dearness allowance        | 1,668        | 1,668        | 3,336        |
| (ii) Addl. dearness allowance | 636          | 636          | 1,272        |
| (iii) Travelling allowance    | 750          | 750          | 1,500        |
|                               | <u>3,054</u> | <u>3,054</u> | <u>6,108</u> |

## 3 Contingencies

|                                   |              |              |               |
|-----------------------------------|--------------|--------------|---------------|
| (i) Apparatus & materials         | 1,000        | 500          | 1,500         |
| (ii) Service postage stamps       | 50           | 50           | 100           |
| (iii) Furniture                   | 500          | 250          | 750           |
| (iv) Petty construction & repairs | 500          | 250          | 750           |
| (v) Miscellaneous                 | 150          | 150          | 300           |
| (vi) Forms & stationery           | 100          | 100          | 200           |
|                                   | <u>2,300</u> | <u>1,300</u> | <u>3,600</u>  |
| Grand Total                       | <u>7,538</u> | <u>6,610</u> | <u>14,148</u> |

|                                                                     |     |     |     |
|---------------------------------------------------------------------|-----|-----|-----|
| Less cost of furniture to be borne entirely by the State Government | 500 | 250 | 750 |
|---------------------------------------------------------------------|-----|-----|-----|

|                                                                    |       |       |        |
|--------------------------------------------------------------------|-------|-------|--------|
| Expenditure to be shared by the Committee and the State Government | 7,038 | 6,360 | 13,398 |
| Committee's share 50%                                              | 3,519 | 3,180 | 6,699  |
| State Government's share including cost of furniture               | 4,019 | 3,430 | 7,449  |

## APPENDIX XXI

### Secretary's Note

*Subject No. 70* Pattern of financial assistance for Statistical, Marketing and other schemes—decision arrived at in the meeting of the Secretaries of the Commodity Committees.

One of the subjects considered at a meeting of Secretaries of Commodity Committees held on 18-7-1959 at Delhi under the Chairmanship of the Vice-President, Indian Council of Agricultural Research to consider matters of common interest to the Committees, was the pattern of the financial assistance for Statistical, Marketing and other schemes.

It was decided at this Conference that Statistical Schemes are of importance to the country and should continue to be financed by the Committee in full and that after the period for which these schemes are sanctioned, the State Governments might take over full responsibilities.

As far as this Committee is concerned, it is financing, wholly out of a Central grant, Statistical Surveys in the various States. In the Third Plan provision has been made for the continuance of these surveys on the same basis of financial assistance.

It has now to be decided in what form these surveys under the Five-Year Plan are to be continued after the III Plan. The State Governments may be asked to take over the entire financial responsibility for new Statistical Schemes in addition to the responsibility of running the schemes which they are having already.

The Marketing & Economics Sub-Committee may consider the subject first.

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## APPENDIX XXII

### Secretary's Note

*Subject No. 71.* Collection of Coconut Cess and of statistics of copra crushed, oil extracted and cake produced — Authorisation of the Committee for enforcement of provisions in Indian Coconut Committee Act 1944 and Rules.

The Indian Central Coconut Committee derives its revenues mainly from a cess of 0.25 nP. per cwt. of copra crushed in the power mills. It is collected by the Central Excise Department by virtue of provisions under Section 3 (1) of the Indian Coconut Committee Act 1944. The assessment of cess is based on the monthly A Form returns furnished by the mill owners under Section 10 of the above Act and Rule 26 of the Indian Central Coconut Committee Rules 1945.



The above Act, however, contains no penal clause to enforce timely submission of these A Form returns and also to take action against those who submit false returns. Under Section 11 (2) of the Act there is provision for summary assessment in the case of those who fail to submit returns, but under section 12 an appeal against such assessment can be made. Usually such appeals are made in the case of summary assessments and considerable delay results in the realisation of cess due to the Committee.

Inclusion of certain penal clauses under the Indian Coconut Committee Act 1944 with a view to make non-submission of A Form returns and also submission of false returns punishable offences were considered by this Committee at its 25th meeting in January 1958 and these were communicated to the Government of India. The Government of India have not yet taken a decision in the matter.

If these penal clauses are introduced they will have to be enforced by the Officers of the Central Excise Department who are authorised to collect coconut cess. It is, however, unlikely that these powers will be made use of in an effective manner in view of the fact that these Officers of the Central Excise Department are already over-burdened with the work of collecting a number of Central Excise duties and cesses and the enforcement of the penal clauses will involve considerable additional work.

Faced with similar difficulties in the receipt of returns under the "Cotton Pressing and Ginning Factories Act", the Indian Central Cotton Committee has recently decided that it would be useful to appoint a certain number of "Liaison Officers" for assisting in the enforcement of the various provisions of all the existing legislation on Cotton. The submission of returns of "Cotton ginning and Pressing Factories Act" and the verification of their accuracy would also come under the duties of these officers.

It, however, appears that even without the appointment of Special Staff much work of the above nature in

respect of coconut cess could be done if some of the existing officers of this Committee contact mill owners in the course of their routine tours. It is suggested that in the first instance the undersigned and the Statistician of the Committee be authorised to visit coconut oil mills for this work under section 13 of the Indian Coconut Committee Act 1944. The above section runs as follows.

“13. Power to inspect mills and take copies of records and accounts. (1) The Collector or any officer empowered by general or special order of the Central Government in this behalf shall have free access at all reasonable times during working hours to any mill or to any part of any mill.

(2) The Collector or any such officer may at any time (during working hours) with or without notice to the owner, examine the (purchase, sale and stock) records and accounts of any mill and take copies of or extracts from all or any of the said records or accounts for the purpose of testing the accuracy of any return or of informing himself as to the particulars regarding which information is required for the purposes of this Act or any rules made thereunder:

Provided that nothing in this section shall be deemed to authorise the examination of any description or formula of any trade process.”

The Marketing and Economics Sub-Committee may first consider and report to the full Committee.

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## A P P E N D I X XXIII

### Secretary's Note

*Subject No. 73-A* Import Policy for coconut and coconut products—April-September 1960.

The Ministry of Food and Agriculture, Government of India have written to say that they have taken up the question of formulating the licensing policy for April-September 1960 and that the views of the Committee in this regard be communicated to them urgently.



The following back-ground information is furnished in this connection:—

In August 1955 at its 22nd meeting the Committee considered the above question and decided that the Government of India be requested to reduce the annual imports of coconut and coconut products to 50,000 tons in terms of copra and that a special sub-committee be constituted to suggest minimum prices for coconut and coconut products.

At its 24th meeting in February 1957 the Committee considered the report of the Special Sub-committee for minimum prices and decided to accept its recommendations which were as given below:—

- 1) That having regard to the close relation between the wholesale prices of coconut, copra and coconut oil in the free market, the minimum prices of coconut oil alone need be fixed leaving the prices of coconut and copra to adjust themselves.
- 2) That the minimum prices of coconut oil at Cochin be fixed at Rs. 1425 per ton and;
- 3) That the imports of copra and coconut oil be restricted when the internal prices approach the minimum prices fixed.

The Government of India to whom the above decisions were communicated, replied that the time was not then opportune for fixing minimum price for coconut oil and that when the larger question of fixing minimum prices for important Agricultural Commodities was taken up for consideration, the Government of India would give due consideration to the recommendations of the Sub-Committee of the Indian Central Coconut Committee regarding minimum price for coconut oil. The Government also stated that since India is now dependent on imports of coconut oil to the extent of one-third of the country's total requirements, the Government of India were in a position to maintain reasonable prices for coconut oil by the mechanism of import duties and import quotas.

Since 1956-57, however, the price of coconut oil has been showing an upward trend and on behalf of Mr. C. E. Bingham, a member of the Committee, representing the Bombay Chamber of Commerce, the Hindustan Lever Ltd., Bombay requested in November 1957 that this Committee should consider the question of taking appropriate measures to control the present rising trend in coconut oil prices in the country.

The Committee considered the above suggestion at its meeting held in January 1958 and decided that in view of the fact that the Government of India had not agreed to fix a floor price for coconut oil with a view to protect the coconut growers when prices were falling, it was not desirable to fix a ceiling price at a time when prices were rising, as the additional income to the coconut growers from the higher prices would be an incentive to the growers to step up the production of coconuts. The Committee also decided that with a view to stabilise the prices of copra and coconut oil in the country the imports of these commodities be regulated through the agency of the State Trading Corporation.

The above decisions were communicated to the Government of India. The State Trading Corporation were also addressed to know their views in the matter of taking over the import trade in coconut products.

The Government of India replied that their import policy was now sufficiently restrictive compared to what it was in the past, but the State Trading Corporation has not yet given a final reply to the question referred to them.

According to the Import Policy for the half-year, October 1958 to March 1960 no import licence will be issued to Established Importers of coconut and coconut products and 'Actual Users' licences will be issued for copra only. There is, however, no ceiling placed on the total imports in a year, as recommended by this Committee.

Annexures I and II to this note show respectively trends in imports of coconut, copra and coconut oil and



also prices at Cochin for the past ten years. Annexure III shows the monthly average prices of coconut oil at Cochin and groundnut oil at Bombay in 1959-60.

It will be seen from the above that imports have shown a downward trend from 1957-58 while the prices of coconut oil have been on the increase from 1956-57. In the current year also the upward trend in price of coconut oil continues. It may, however, be noted that the prices of other vegetable oils are also rising as can be seen from monthly prices of groundnut oil in Annexure III.

The Committee may now decide if any modification in the current licensing policy has to be recommended to the Government of India for the next half year and in particular if any ceiling in the total annual imports should be suggested.

The Marketing and Economics Sub-committee may first discuss and recommend to the full Committee.

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# ANNEXURE I

## Imports of Coconut, Copra and Coconut Oil into India

| Country                  | 1949-50                                 | 1950-51 | 1951-52 | 1952-53 | 1953-54 | 1954-55 | 1955-56 | 1956-57 | 1957-58 | 1958-59 |
|--------------------------|-----------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                          | <b>1. Coconut (in thousands)</b>        |         |         |         |         |         |         |         |         |         |
| Ceylon                   | 1232                                    | 704     | 1025    | 1053    | 84      | 559     | 136     | 67      | 197     | —       |
| Maldives                 | 4                                       | 65      | 5       | —       | 4       | 533     | 1202    | 419     | 5       | 156     |
| Others                   | 11                                      | 12      | —       | —       | 119     | 291     | —       | 78      | 56      | 3       |
| Total                    | 1247                                    | 781     | 1030    | 1053    | 207     | 1383    | 1338    | 564     | 258     | 159     |
|                          | <b>2. Copra (in hundred tons)</b>       |         |         |         |         |         |         |         |         |         |
| Ceylon                   | 112                                     | 85      | 72      | 154     | 193     | 404     | 666     | 504     | 305     | 321     |
| St. Settlements & F.M.S. | 5                                       | —       | 11      | 13      | 45      | 153     | 16      | 357     | 801     | 511     |
| Seychelles               | —                                       | —       | 31      | 26      | 57      | 59      | 65      | 54      | 55      | 63      |
| Others                   | 6                                       | —       | 1       | 1       | 2       | 26      | 62      | 69      | 65      | 71      |
| Total                    | 123                                     | 85      | 115     | 194     | 297     | 642     | 809     | 984     | 1226    | 966     |
|                          | <b>3. Coconut Oil (in hundred tons)</b> |         |         |         |         |         |         |         |         |         |
| Ceylon                   | 43                                      | 55      | 112     | 85      | 90      | 109     | 118     | 100     | 66      | 18      |
| St. Settlements & F.M.S. | 267                                     | 113     | 156     | 101     | 169     | 119     | 102     | 92      | 67      | 27      |
| Others                   | —                                       | —       | 17      | 16      | —       | —       | 1       | 1       | —       | —       |
| Total                    | 310                                     | 168     | 285     | 202     | 259     | 228     | 221     | 193     | 133     | 45      |
| Total in terms of copra  | 626                                     | 357     | 576     | 520     | 714     | 1011    | 1167    | 1296    | 1442    | 1039    |

— 576 —



## ANNEXURE II

### Prices of Coconnts, Copra and Coconut Oil at Cochin.

| YEAR    | Coconut                        |            | Copra              |            | Coconut Oil        |            |
|---------|--------------------------------|------------|--------------------|------------|--------------------|------------|
|         | (Without husk)                 | Index<br>* | price              | Index<br>* | price              | Index<br>* |
|         | price per<br>(1000)<br>Rs. nP. |            | per ton<br>Rs. nP. |            | per ton<br>Rs. nP. |            |
| 1949-50 | 182.50                         | 100        | 1361.12            | 100        | 1989.25            | 100        |
| 1950-51 | 193.75                         | 106        | 1526.31            | 112        | 2289.19            | 115        |
| 1951-52 | 192.50                         | 105        | 1442.12            | 106        | 2136.56            | 107        |
| 1952-53 | 136.75                         | 75         | 1116.94            | 82         | 1662.25            | 84         |
| 1953-54 | 152.81                         | 84         | 1200.06            | 88         | 1774.62            | 89         |
| 1954-55 | 139.75                         | 77         | 1043.50            | 77         | 1549.12            | 78         |
| 1955-56 | 118.94                         | 65         | 923.69             | 68         | 1363.37            | 69         |
| 1956-57 | 133.94                         | 73         | 1011.94            | 74         | 1470.75            | 74         |
| 1957-58 | 164.33                         | 90         | 1279.62            | 94         | 1888.23            | 95         |
| 1958-59 | 192.56                         | 106        | 1471.83            | 108        | 2168.96            | 109        |

\* Base year = 1949

## ANNEXURE III

### Average Monthly Prices of Coconut Oil and Groundnut Oil.

| Year and month | Coconut Oil<br>(Cochin) | Groundnut Oil<br>(Bombay) |
|----------------|-------------------------|---------------------------|
|                | price per ton           | price per ton.            |
| 1959           | Rs. nP.                 | Rs. nP.                   |
| April          | 2002.86                 | 1609.52                   |
| May            | 2062.23                 | 1735.54                   |
| June           | 2071.58                 | 1729.56                   |
| July           | 2084.34                 | 1680.56                   |
| August         | 2081.24                 | 1583.39                   |
| September      | 2151.93                 | 1614.42                   |
| October        | 2222.88                 | 1643.82                   |
| November       | 2231.23                 | —                         |

## APPENDIX XXIV

### Secretary's Note

*Subject No. 73-B.* Scheme for the development of coconut marketing in Orissa.

A scheme for the development of coconut marketing in Orissa State received from the Director of Agriculture & Food Production, Orissa, is attached to this note. The scheme envisages the taking over of the work of the Sakhigopal Coconut Growers' Co-operative Society, Ltd., installing a "Chula" Copra Drier, constructing a copra drying yard and a godown and to appoint the required staff. The Orissa Government have since approved of the scheme.

The proposal involves a capital expenditure of Rs. 26,000 and a recurring expenditure of Rs. 7,602 less a sum of Rs. 264 being second additional dearness allowance of staff which will be shared by the Central and State Governments. The State Government will be meeting the entire capital expenditure and the recurring expenditure (less the 2nd additional dearness allowance) is proposed to be shared by the State Government and the Committee on a 50:50 basis. The Committee's share of expenditure is estimated at Rs. 3,669 during the first year. The scheme may be sanctioned for a period of one year.

The subject may be considered first by the Marketing and Economics Sub-Committee.

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Copy of letter No. 3/12 dated 31st December, 1959 from Shri. A.L. Nair, I. A. S., Director of Agriculture & Food Production, Orissa, Bhubaneswar to The Secretary, Indian Central Coconut Committee, Camp Coimbatore.  
Sub:- Annual Meeting of the Indian Central Coconut Committee - subjects for consideration - January, 1960.

Sir,

1. In continuation of my letter No. 1/R dated 31-12-'59 I am sending the following subject for consideration of the Committee at its January, 1960, meeting. I would request you to place it on the agenda.



(i) Scheme for the Development of Coconut marketing in Orissa.

2. It is regretted that the above scheme could not be sent earlier.

### **Scheme for the Development of Coconut Marketing in Orissa.**

There is only one Co-operative Marketing Society for coconuts in the entire State of Orissa. It is situated at Sakhigopal. The Society is called "The Sakhigopal Coconut Growers' Co-operative Society Ltd". It is nicely located in a central place of coconut production and can safely make business both inside and outside the State. There are 363 members with a paid up share capital of Rs. 8958, the value of each share being fixed at Rs. 10. It has an overall working capital of Rs. 12,000 (including Rs. 8958 share capital). The annual business is near about Rs. 80,000. During the year 1957-58 the Society has earned a net profit of Rs. 846. Since then it is running on profit. From the receipt and expenditure statement for the period from 1-7-1959 to 30-11-59 it is noticed that the society has earned a profit of Rs. 874. It is therefore expected that the Society will work with profit and do its best for the betterment of the coconut cultivators in the State.

2. It is desired that this Society being the only Growers' Society needs all encouragement by way of financial and personnel assistance. Also arrangements will have to be made for preparation of copra for marketing purposes, instead of merely exporting the whole nuts to outside the State at different prices in different seasons depending on the availability of wagons.

3. The present scheme, in consideration of these aspects, envisages the installation of one "Chula" copra dryer, one drying yard, one godown, adequate contingencies and suitable staff. The financial implications required for the operation of the scheme for one year during 1960-61 are given below:—

### Statement

|                                                                    |              |
|--------------------------------------------------------------------|--------------|
| 1. <i>Pay of Establishment:—</i>                                   | Rs.          |
| 1. One Inspector (Rs. 120-5-155-EB-160-10-220-EB-10/2-250/- P. M.) | 1440         |
| 2. One clerk-cum Typist.<br>(Rs. 70-2-80-4-100 P. M.)              | 840          |
| 3. One Grader (Rs. 85-2-97-3-115-4-155 P.M.)                       | 1020         |
| 4. One Peon (Rs. 18/- 1/2-24/- P.M.)                               | 216          |
| 5. One Watchman (Rs. 16-1/2-22 P. M.)                              | 192          |
| Total                                                              | <u>3708</u>  |
| 2. <i>Allowances:—</i>                                             |              |
| 1. Dearness allowance                                              | 1380         |
| 2. 2nd Addl. Dearness Allowance                                    | 264          |
| 3. Travelling Allowance                                            | 250          |
| Total                                                              | <u>1894</u>  |
| 3. <i>Contingencies:— (Non-recurring)</i>                          |              |
| 1. Installation of one "Chula Copra Drier"                         | 11000        |
| 2. One drying yard                                                 | 5000         |
| 3. One godown                                                      | 10000        |
| Total                                                              | <u>26000</u> |
| 4. <i>Recurring contingencies:—</i>                                | 2000         |
| Total                                                              | <u>2000</u>  |
| Grand Total                                                        | <u>33602</u> |

The Scheme involves a total expenditure of Rs. 33602 for one financial year. The Indian Central Coconut Committee is requested to meet 50% of the recurring expenditure (amounting to Rs. 3669) while the State Government meeting the rest of recurring and non-recurring expenditure amounting to Rs. 29938 (including a sum of Rs. 264 provided under second Additional Dearness allowance of staff which is to be shared by the Central and the State Governments on 66 $\frac{2}{3}$  and 33 $\frac{1}{3}$  basis).



## APPENDIX XXV

### Secretary's Note

#### NEW SCHEME

*Subject No. 76.* Scheme for effecting improvements in the extraction of Oil from Copra by rotary and expeller at the Anantapur Institute.

1. Name of the scheme: Scheme for the improvement in extraction of oil from copra by rotary and expeller.
2. Location: Oil Technological Institute, Anantapur, Andhra Pradesh.
3. Object of the scheme: To increase the efficiency of rotary and expeller with a view to getting higher yield of oil from copra.
4. Duration of the scheme: Two years.
5. Cost of the scheme:
  - a) *Expenditure.*

|                                  |               |
|----------------------------------|---------------|
| Non-recurring                    | Rs. 6,500.00  |
| Recurring                        | Rs. 60,316.00 |
| Share of the Com-<br>mittee      | Rs. 66,816.00 |
| Share of the State<br>Government | Nil           |
  - b) *Receipts.*

|                                  |               |
|----------------------------------|---------------|
|                                  | Rs. 32,000.00 |
| Share of the<br>Committee        | Rs. 32,000.00 |
| Share of the State<br>Government | Nil           |
  - c) *Net cost*

|                                  |               |
|----------------------------------|---------------|
|                                  | Rs. 34,816.00 |
| Share of the Com-<br>mittee      | Rs. 34,816.00 |
| Share of the State<br>Government | Nil           |

10 Remarks of the Secretariat on the proposal

(1) At its last meeting (January, 1959) the Committee had decided that the Principal, Oil Technological Institute, Anantapur be requested to forward a scheme for effecting improvements in the expression of oil from copra by rotary and expeller. The present scheme has been submitted by the Principal Oil Technological Institute, Anantapur through the Government of Andhra Pradesh in accordance with that decision.

(2) The scheme is estimated to cost Rs. 66,816.00 for a period of 2 (Two) years. The entire expenditure on the scheme will have to be met by the Committee. The entire receipts estimated at Rs. 32,000.00 will go to the Committee.

(3) It may be mentioned in this connection that a sum of Rs. 3.04 lakhs has been allotted under the Second Five-Year Plan for the execution of Technological Research Schemes, of which an amount of Rs. 1.77 lakhs has already been allocated for schemes to be worked at the Central Coconut Research Station, Kasaragod, the Central Food Technological Research Institute, Mysore and the Regional



Research Laboratory Hyderabad. The present scheme can therefore be financed from the balance of Rs. 1.27 lakhs available for expenditure on coconut technological schemes. The scheme will, however, have to be made co-terminus with the Second Plan. It can be expected to start functioning on 1-4-1960 after obtaining Government of India's sanction for it. In that case the expenditure to the Committee will be of the order of Rs. 36,480.00. The receipts may be estimated at Rs. 16,000.00. The net expenditure to the Committee will thus be Rs. 20,480.00 for a period of one year from 1-4-1960. It is, therefore, suggested that the scheme may be sanctioned by the Committee for a period of one year only from 1-4-1960 for the present. The question of continuing the scheme beyond 31-3-1961 may be considered after the programme of research work under the Third Plan is finalised.

(4) No provision for the scheme exists in the Budget Estimates (Part II) of the Committee for 1960-'61. The Government of India's sanction for a supplementary grant of Rs. 20,480.00 for 1960-'61 under the Part II

Budget may, therefore, be applied for if the Committee approves of the scheme.

(5) It is suggested that as in the case of the staff under the schemes worked at the Central Food Technological Research Institute, Mysore and the Regional Research Laboratory, Hyderabad, the staff under the present scheme may also be recruited in accordance with the rules of the Andhra Pradesh Government.

The Committee may now decide (1) whether they would approve of the scheme at a cost of Rs. 20,480.00 to the Committee for one year from 1-4-1960, (2) whether they would approve of the suggestion to ask for a supplementary grant of Rs. 20,480.00 under the Part II Budget for 1960-'61, to finance the scheme and (3) whether they agree to the recruitment of the staff in accordance with the recruitment rules of the Andhra Pradesh Government.

The subject may be considered first by the Technological Sub-Committee.

### **Scheme For Improvements In Expression of Oil From Copra by Rotary and Expeller**

#### *Introduction:*

It is reported that in 1949 (vide Oil Mill Gazetteer April, 1952, P. 31) coconut oil ranked first among vegetable oils moving in international trade. It exceeded all other vegetable oils such as peanut, castor, cottonseed etc. This shows the predominance of coconut oil in the work as far as production and consumption is concerned. But the situation in India is somewhat different. While India produces surplus quantities of other oils like groundnut, castor, etc., for export thus earning foreign exchange, coconut oil is an exception and large



quantities of copra as well as coconut oil are imported to our country to meet the internal requirements. While the production of coconuts was concentrated in relatively smaller areas, the coconut oil found application in many industries and huge quantities of oil were used for industrial purposes.

Moreover, copra is crushed mainly in ghanies and rotaries whose efficiency and capacities are low. Even the expression carried out in expellers in India leaves much scope for improvement. Analytical work carried out at this Institute on coconut cakes showed that the oil content of ghani cakes varied from 13.4% to 17.4%, with an average of 15.3% and that of rotary cakes from 10.0% to 14.7% with an average of 11.8%. A very recent analysis of 6 samples of rotary cakes collected personally by the Principal from Alleppey and Ernakulam area of Kerala showed that the oil content varied from 10.8% to 13.1%, with an average of 11.9%. Figures obtained for the oil content of expeller coconut cakes from the oil mills crushing copra vary from 8 to 10%. Apart from these no data are available on the processing of copra in rotaries and expellers.

Now that coconut cultivation is also being vastly extended to the other parts of the country, as a complementary measure, there is every necessity of carrying out technological investigation with a view to increasing the efficiency of rotaries and expellers for getting higher yield of oil from copra.

The technical programme on the pilot plant work on processing of copra in rotaries and expellers so as to effect improvements for extracting higher yields of oil with an eye on quality of products namely, oil and cake, is given below:-

*Programme: A. Expeller crushing.*

*Conditions for effective size reduction:*

1. Reducing the size of raw copra by (i) Cutting (ii) in disintegrator (iii) Disc mill and (iv) Grinder.

2. Pre-drying copra and its effect on the size-reduction of copra in the above series of experiments.

3. (a) Finer reduction of the broken copra in (i) and (ii) by rollers or attrition mill and its effect on milling performance.

(b) Use of copra cutter used at present in the rotary chekku crushing, instead of the above equipment.

4. Studies in the cooking of copra prior to crushing with reference to (i) cooking time (ii) optimum moisture and (iii) temperature.

5. Studies in the oil to be left in the first pressed cake so as to get maximum efficiency during subsequent pressings.

6. Size reduction of first pressed cake preparatory to second pressing.

7. Studies in the optimum conditions of second pressing.

8. Studies in the different spacers to be used in first and second pressings.

9. Studies of the factors like temperature, cooking, worm arrangements etc., that are responsible for "browning" or charring of coconut meal. The effect of cooling the expeller barrel in preventing the charring of the cake.

10. Because of very high oil content in copra, there will be oil losses at various stages of processing and, therefore, losses (material and oil) occurring will be assessed and overall material and oil-balances calculated.

11. Based on the above studies recommendations shall be made as to the optimum conditions for efficient methods of milling copra with reference to both equipment to be used and processing to be followed.

#### *B. Rotary crushing:*

1. Items 1, 2, 3 and 4 are same as in the case of expeller work for pre-treatment and cooking conditions.

2. Items 5, 6 and 7 are similar for first and second crushings.



3. The special problems pertaining to the parts of rotaries like pestle, chain length, mortar as well as drainage of oil, etc., will be studied.

4. Addition of substances like gums, molasses and some such materials capable of increasing the pressability of copra will be tried and their need or otherwise will be examined. Based on the above studies, recommendations will be made regarding the alteration required to be made in the existing processes and the optimum conditions for getting higher yields of oil of better quality.

### Estimates of Expenditure.

The Institute is fully equipped for laboratory and pilot plant work on expeller. However, it does not have any rotary mill. It would be necessary to have two rotary units and one copra cutter and the necessary drivers. A few containers also will be required. These will be required to be met from funds to be sanctioned in the scheme.

#### 1. *Non-recurring:*

|                                                                         |                       |                     |
|-------------------------------------------------------------------------|-----------------------|---------------------|
| (1) Two rotaries, complete with spare parts — a motor and starter, etc. | } Based on quotations | Rs. 3,200.00        |
| (2) A copra cutter, complete as above                                   |                       |                     |
| (3) Oil storage tank (L. S. estimate)                                   |                       | Rs. 1,800.00        |
| (4) Erection charges                                                    |                       | Rs. 1,000.00        |
|                                                                         |                       | Rs. 500.00          |
|                                                                         | Total                 | <u>Rs. 6,505.00</u> |

#### 2. *Recurring:*

|                                                                                   | 1st year | 2nd year | Total |
|-----------------------------------------------------------------------------------|----------|----------|-------|
| (a) <i>Staff</i>                                                                  | Rs.      | Rs.      | Rs.   |
| (i) Senior Scientific Assistant at Rs. 250-500 plus Rs. 70 as allowance P. M.     | 3,840    | 4,140    | 7,980 |
| (ii) 1 Junior Scientific Assistant at Rs. 160-330 plus Rs. 65 as allowances P. M. | 2,700    | 2,820    | 5,520 |

|                                                                                              |        |        |           |
|----------------------------------------------------------------------------------------------|--------|--------|-----------|
| (iii) 1 Laboratory Assistant<br>at Rs. 45-75 plus Rs. 50<br>as allowances P. M.              | 1,140  | 1,176  | 2,316     |
| (b) <i>Raw materials.</i>                                                                    |        |        |           |
| 12 tons per year at<br>Rs. 1,500 per ton                                                     | 18,000 | 18,000 | 36,000    |
| (c) <i>Contingencies.</i>                                                                    |        |        |           |
| (i) Chemicals                                                                                | 750    | 750    | 1,500     |
| (ii) Water, gas, steam and<br>electricity                                                    | 1,500  | 1,500  | 3,000     |
| (iii) Labour                                                                                 | 250    | 250    | 500       |
| (iv) Repairs, replacements<br>to rotary and expeller<br>parts and containers.                | 1,000  | 1,000  | 2,000     |
| (v) T. A. for staff                                                                          | 300    | 200    | 500       |
| (vi) Miscellaneous items<br>like stationery, petty<br>contingencies & unfore-<br>seen items. | 500    | 500    | 1,000     |
| A. Total recurring                                                                           | 29,980 | 30,336 | 60,316    |
| B. Total non-recurring                                                                       | 6,500  | —      | 6,500     |
| Grand total for 2 years                                                                      |        |        | 66,816    |
| <i>Anticipated receipts.</i>                                                                 | Rs.    | Rs.    | Rs.       |
| 1. Crude Oil-62½% yield 7.5<br>tons oil at Rs. 2,000-per ton                                 | 15,000 | 15,000 | 30,000    |
| 2. Cake-33⅓% yield 4 tons at<br>Rs. 250                                                      | 1,000  | 1,000  | 2,000     |
|                                                                                              | 16,000 | 16,000 | 32,000    |
| 3. Net expenditure to the<br>Indian Central Coconut Committee                                |        |        | 34,816.00 |

The total expenditure has to be fully borne by Indian Central Coconut Committee and all the receipts will be credited to the Committee as and when the products are sold out.



## APPENDIX XXVI

### Secretary's Note

*Subject No. 80.* Delegation of powers to Secretary, Indian Central Coconut Committee — enhancement of — decisions arrived at in the meeting of Secretaries of Commodity Committees.

A meeting of the Secretaries of Commodity Committees was held on 18-7-1959 at Delhi under the Chairmanship of the Vice-President, Indian Council of Agricultural Research to consider matters of common interest to the Committees. At this meeting the Chairman said that much of his time was being taken up in according sanction to several routine matters which are referred to him in his capacity as the President by the various Commodity Committees. He, therefore, directed that the Under Secretary (Commodities) should examine the existing schedule of powers delegated to the Secretaries and President of the various Commodity Committees and draw up a tentative list of enhanced powers that could be delegated to the Secretaries of the Committees, so that suitable proposals in this connection could be put up to the respective Committees. He further added that the idea was that subject to the requirements of adequate check in administrative matters relating to the Committees, the powers of the Secretaries should be enhanced, so as to save the time of the President over such routine matters. The suggestions of the Under Secretary, Ministry of Food and Agriculture, regarding enhanced powers for the Secretaries of Commodity Committees were communicated to this Committee, in his letter No. 11-68/59-Com. I dated 13-10-1959 (Vide Annexure I). It is stated in this letter that the powers proposed to be delegated to the Secretaries should not in any way take away the powers now being exercised by the Secretary, the Director and Joint Director.

The powers now vested in the Secretary, the powers suggested to be delegated by the Ministry of Food and Agriculture and the suggestions of the Secretariat of the

Committee are shown in Annexure II. The following comments are offered on the suggestion of the Ministry of Food and Agriculture.

*To make appointments to sanctioned posts.*

The existing power which enables Secretary to make appointments to sanctioned posts carrying a maximum pay of Rs. 250 and below per mensem is in accordance with Rule 17 (1) (c) of the Indian Central Coconut Committee Rules. Power to make appointments to posts whose maximum pay does not exceed Rs. 330 may be delegated and the above-mentioned rule suitably modified accordingly.

It is suggested that Rule 17 (1) (c) may be modified to read as follows:—

“Appointment to posts of which the maximum does not exceed Rs. 330 per mensem may be made by the Secretary.”

The Government of India may be requested to notify the amended rule.

In respect of Serial Nos. 3 (a), 5, 6 and 12 of the existing schedule of powers, the modifications suggested by the ministry of Food and Agriculture, Government of India would in effect be a reduction of powers already delegated to the Secretary or the Director and the Joint Director. It is, therefore, suggested that these powers may be retained.

In the case of item 11 it is suggested that the limit of Rs. 750 imposed for granting Travelling Allowance advances may be removed so as not to trouble the President in such matters. The Ministry's suggestion if accepted will have this effect and may be done.

With regard to Serial Nos. 7, 8, 14 and 21 in the existing schedule of powers, the Ministry's recommendations may be adopted.

In view of the decision to enhance Secretary's powers of appointment to posts which carry a maximum pay of Rs. 330 per mensem, in the matter of making officiating arrangements and also of granting premature increments, similar enhancement of powers has to be made. Suggestions relating to this are also made in Annexure II against Serial Nos. 3 (b) & 10 of the schedule of powers.



Serial No. 16 of the schedule of powers may be modified to include the suggestion of the Ministry of Food and Agriculture in respect of punishments etc., as indicated in Annexure II.

The Finance Sub-Committee may first consider the proposals.

## A N N E X U R E I

Copy of letter No. 11-68/59-Com. I dated 13th October 1959 from Shri Ajudhia Prasada, Under Secretary to the Government of India, Ministry of Food and Agriculture (Department of Agriculture), Indian Council of Agricultural Research, New Delhi to the Secretary Indian Central Coconut Committee, Ernakulam and/etc.

Sub:- Delegation of powers — Enhancement of.

I am directed to say that in accordance with the decision arrived at in the meeting held with the Secretaries of the various Commodity Committees etc., on the 18th July 1959 to consider matters of common interest to the Committees, it has tentatively been decided that the following powers may be delegated to the Secretary, Indian Central Arecanut Committee, Indian Central Coconut Committee, Indian Central Jute Committee and Indian Lac Cess Committee.

1. *To make appointments to sanctioned posts:*

To make appointments to sanctioned posts maximum of whose pay scale does not exceed Rs. 330 per mensem. These powers will be exercised on the recommendations of the Scientific Appointment Sub - Committee in the case of posts requiring technical and/or scientific qualifications and on the recommendations of a Departmental Promotion Committee in the case of other posts.

2. *To grant leave to officers and staff:*

To sanction leave to the staff in the Committee's Secretariat, whom he would be competent to appoint without any restriction on the duration of leave. Regarding other staff and officers in the Secretariat of the Committee to sanction leave upto a period of three months only, provided no officiating arrangements are necessary.

3. *To authorise the employees of the Committee to proceed on duty to any part of India or foreign settlement in India and to grant them Travelling Allowance in accordance with the supplementary rules of the Government of India.*

Full powers in respect of all the staff and officers except himself and Director (s).

4. *To countersign pay and Travelling Allowance Bills.*

To countersign pay bills of officers and staff of the Committee. To countersign Travelling Allowance Bills of all officers and staff of the Committee, except his own and those of Director (s) and to countersign Travelling Allowance Bills of non-official members.

5. *To sanction advances for purchase of conveyance:*

Full power in respect of the staff, he is competent to appoint himself, in accordance with the provisions of Civil Account Code.

6. *To grant advances of Travelling Allowance.*

Full powers in respect of officers and staff, whose Travelling Allowance bills he is competent to countersign, the power being exercised in accordance with the Supplementary Rules of the Government of India subject to the limits with regard to Travelling Allowance and Daily Allowance set out in paragraphs 265 and 269 of General Financial Rules (Vol.I) as amended from time to time.

7. *To sanction grant or acceptance of honorarium or fee and to sanction the undertaking of work for which an honorarium or fee is sanctioned:*

To sanction grant or acceptance of honorarium or fee etc., upto Rs. 50 in any individual case.

8. *To sanction medical attendance fees and cost of medicines for the servants of the Committee:*

Full powers in respect of the officers and staff, whose Travelling Allowance bills he is competent to countersign.

9. *To sanction temporary advances from the Provident Fund Account, subject to the provisions of the Provident Fund Rules of the Committee.*



Full powers in respect of officers and staff, except himself and the Directors.

10. *To grant concessions to persons proceeding to Pasteur Institute for anti-rabic treatment:*

Full powers in respect of staff, which he is competent to appoint.

11. *To suspend, censure, with-hold increments and promotions, reduce to a lower service, grade or post, lower time scale or to a lower stage in a time scale, compulsorily retire, remove, dismiss the servants of the Committee:*

Full powers in respect of the staff, he is competent to appoint, subject to the principles laid down in the Central Civil Services (Classification Control and Appeal) Rules, 1957 as adopted by the Committee. This is further subject to the condition that where it is proposed to award any of the major penalties prior approval of the President will be obtained. The Secretary may also suspend officers and staff of the Committee, the maximum of whose pay scale does not exceed Rs. 500 per mensem subject to its ratification by the President which would be sought by the Secretary soon after an employee has been so suspended.

12. *To write off losses in term off article 227 of the Civil Account Code, (For secretary, Indian Lac Cess Committee only):*

To write off losses upto a limit of Rs. 100 for a single item and not exceeding Rs. 1000 a year in aggregate.

The enhanced powers proposed above should not, in any way, take away the powers at present being exercised by the Directors, Joint Directors, Administrative Officers etc., of the Committees, if any.

The above proposals may kindly be placed before the next meeting of the Committee for their consideration. Formal approval of the Government of India may be sought thereafter, wherever necessary.

Action taken in the matter may kindly be intimated to this Ministry at an early date.

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## ANNEXURE II

| Sl. No. in<br>existing<br>Schedule<br>of powers | Power                                     | Extent of power delegated<br>to Secretary at<br>present                                                                                                                                    | Recommendation<br>of the Ministry of<br>Food and Agriculture                                                                                                                                                                                                                                                     | Recommendation<br>of the Secretariat of the<br>Committee                         |
|-------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 1                                               | 2                                         | 3                                                                                                                                                                                          | 4                                                                                                                                                                                                                                                                                                                | 5                                                                                |
| **1                                             | To create temporary appointments.         | —                                                                                                                                                                                          | —                                                                                                                                                                                                                                                                                                                | —                                                                                |
| 2                                               | To make appointments to sanctioned posts. | For posts the maximum pay of which does not exceed Rs. 250 per month except for those posts carrying a maximum pay of Rs. 100 and more and requiring academic or technical qualifications. | To make appointments to sanctioned posts the maximum pay of which does not exceed Rs. 330 per mensem. These powers shall be exercised on the recommendations of the scientific appointments sub-Committee in the case of posts requiring technical and / or scientific qualifications and on the recommendations | Enhanced power as in column 4 may be delegated, Rule 17(1) (c) suitably amended. |



| 1    | 2                          | 3                                                                                                                                                                                        | 4                                                                                                                                                                                                                                                                                                      | 5                                               |
|------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
|      |                            |                                                                                                                                                                                          | of a Departmental Appointments Committee in the case of other posts coming under its purview.                                                                                                                                                                                                          |                                                 |
| 3(a) | To sanction grant of leave | (i) All staff in the office of the Secretary and Central Coconut Research Stations, Kasaragod and Kayangulam and Research Staff of which maximum pay does not exceed Rs. 500 per mensem. | To sanction leave to the staff of the Committee whom he would be competent to appoint without any restriction on the duration of leave. Regarding other staff and officers of the Committee, to sanction leave up to a period of three months only provided no officiating arrangements are necessary. | Existing powers as in column 3 may be retained. |
|      |                            | (ii) All officers of the Committee the maximum of whose pay exceeds Rs. 500 per mensem up to 3 months at any one time only.                                                              |                                                                                                                                                                                                                                                                                                        |                                                 |

| 1    | 2                                | 3                                                                                                                                                                                                                                                                                                                    | 4 | 5                                                                                                                                                                                                        |
|------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3(b) | To make officiating arrangements | All staff in the office of the Secretary and the Research staff of which the maximum pay does not exceed Rs. 250 per mensem except in the case of appointments to posts for a period exceeding six months and carrying a maximum pay of Rs. 100 a month and more and requiring academic or technical qualifications. | — | All staff in the office of the Secretary and Research Stations of which the maximum pay does not exceed Rs. 330 per mensem except in the case of appointment to posts for a period exceeding six months. |

\*\* 4 To grant travelling allowance to persons (other than members and employees) required to travel in the interest of the Committee.



| 1 | 2                                                                                                                                                                                                                            | 3                                                                                                                                                                                                                                                                               | 4                                                                                                                                                                                                                                                     | 5                                            |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| 5 | To authorise the employees of the Committee to proceed on duty to any part of India or foreign settlement in India and to grant them travelling allowance in accordance with supplementary rules of the Government of India. | To all staff of the Committee except the Secretary.                                                                                                                                                                                                                             | Full powers in respect of all the staff and officers except himself and Director and Joint Director.                                                                                                                                                  | Existing powers in column 3 may be retained. |
| 6 | To countersign pay and Travelling Allowance bills.                                                                                                                                                                           | <ol style="list-style-type: none"> <li>1. All officers and staff of the Committee.</li> <li>2. Travelling allowance bills: <ol style="list-style-type: none"> <li>(a) of non official members.</li> <li>(b) of persons (other than members or employees)</li> </ol> </li> </ol> | <ol style="list-style-type: none"> <li>1. Pay bills of all officers and staff of the Committee.</li> <li>2. Travelling allowance bills of all officers and staff of the Committee except his own and those of Directors and to countersign</li> </ol> | Existing powers in column 3 may be retained. |



